Amphibian, Reptile and Northern Bog Lemming Survey on the Rocky Mountain Front: 1996

A Report to:

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ABSTRACT

A total of 18 sites were surveyed for amphibians and reptiles of which only 5 had one or more amphibian or reptile species present. Many of these surveys covered large areas (e.g. the entire Blackleaf Fen) and 1000-2000 m of streams. Due to the relatively small size of the study area and the lack of water across much of the landscape, every known non-beaver pond, a sampling of beaver ponds within each drainage where they are known to occur, and a least 1000 m of most streams were sampled. A total of 10-1200 person-minutes were spent at each site, depending upon the size of the area and what was found. Initially, the entire shoreline, or a major part thereof, was searched by walking slowly along the edge and up into the surrounding vegetation, including rolling over rocks and logs. At regular intervals, the aquatic habitat was sampled for tadpoles or larvae using dipnets.

Although no species were found at 13 sites, their absence may have been due to the time of day, weather conditions, sampling too late in the season for some species, or other factors at the time of sampling. This area is very arid, with many of the streams disappearing underground for long distances by mid-summer and many ponds drying up. Even most of the streams with water were very low flows in a wide gravel bed, and, lacking stream side vegetation, not suitable for amphibians. The only snakes found were garter snakes, possibly due to the short growing season. Reptile reproduction is closely tied to environmental conditions, and in the cold climate of the Rocky Mountain Front, it is possible that many species just cannot reproduce successfully.

Three amphibians were found on the study area: Tiger Salamander (*Ambystoma tigrinum*), Northern Chorus Frog (*Pseudacris triseriata*), and Spotted Frog (*Rana pretiosa)*. The Tiger Salamander was found in a few ponds near the forest/prairie ecotone. The Northern Chorus Frog is apparently the most widespread amphibian throughout the study area, occurring most commonly in prairie ponds and ditches. During May surveys they were frequently heard calling from a variety of wetland sites. The Spotted Frog was found in two ponds within forested habitat. Five additional amphibians may occur on the study area, but were not encountered during surveys, nor are there any records of them. They include: Long-toed Salamander (*Ambystoma macrodactylum*), Tailed Frog (*Ascaphus truei*), Western Toad (*Bufo boreas*), Plains Spadefoot (*Scaphiopus bombifrons*), and Northern Leopard Frog (*Rana pipiens*).
The Long-toed Salamander, Tailed Frog, and Western Toad were all found in very small numbers in forested habitat on the RMRD in 1994, near the study area. A single Northern Leopard Frog was found in a beaver pond on Pine Butte Swamp in 1993, the nearest known record to the study area. Northern Leopard Frogs are nearly extirpated from western Montana, and recent evidence indicates a decline elsewhere in Montana (except the southeast corner). They typically inhabit prairie ponds and creeks; all sightings should be reported. One other prairie-inhabiting amphibians has been recorded to the east of the study area, the Plains Spadefoot (*Scaphiopus bombifrons*).

Ten reptiles have been reported from near the study area, but only two were found there: the Western Terrestrial Garter Snake (*Thamnophis elegans*) and Common Garter Snake (*Thamnophis sirtalis*). The following reptiles have been recorded in the area and may eventually be found on the study area: Painted Turtle (*Chrysemys picta*), Short-horned Lizard (*Phrynosoma douglasi*), Rubber Boa (*Charina bottae*), Racer (*Coluber constrictor*), Western Hognose Snake

(*Heterodon nasicus*), Gopher Snake (*Pituophis catenifer*), Plains Garter Snake (*Thamnophis radix*), and Western Rattlesnake (*Crotalus viridis*).

I searched for suitable habitat for northern bog lemmings while traveling to and conducting reptile and amphibian surveys across the study area. The only site within the study area with even marginally suitable habitat was Blackleaf Swamp. Northern bog lemmings were not captured there, nor at nearby Pine Butte Swamp. At both sites however, 4-5 species of other small mammals were captured, including masked shrews (*Sorex cinereus*), montane shrews (*Sorex monticolus*), water shrews (*Sorex palustris*), meadow voles (*Microtus pennsylvanicus*), and deer mice (*Peromyscus maniculatus*).

The habitat on the study area appears to be very limited for northern bog lemmings; the only suitable site seen was trapped. Trapping intensity was probably sufficient to detect lemmings had they been present; more surveys are not warranted at this time. Additionally, many meadow voles were captured at Blackleaf and bog lemmings have not been found at sites with high numbers of meadow voles also present at any Montana location (Reichel and Beckstrom 1993, 1994). It seems unlikely that bog lemmings are actually present, but went undetected at this site.

ACKNOWLEDGMENTS

We thank Kristi DuBois, Mike Enk, and Dave Whittekiend for their help throughout the study. Additional field assistance, location of possible survey sites, information on herp observations, and other support was provided by Tad Day, Dan Downing, Don Godtel, Stan Van Sickle, and Kirwin Werner. D. D. Dover, C. Jones, and A. Phillips assisted with element occurrence and map preparation. Financial support for the project came from the Lewis and Clark National Forest (U.S. Forest Service, Northern Region), Montana Department of Fish, Wildlife and Parks, Great Falls Resource Area (Bureau Of Land Management) and the Montana Natural Heritage Program (Montana State Library, Natural Resources Information System and The Nature Conservancy).

Museum records were received from: American Museum of Natural History, Academy of Natural Science, Brigham Young University, California Academy of Science, Carnegie Museum, University of Puget Sound Museum, Field Museum of Natural History, Glacier National Park Museum, Illinois Natural History Survey, University of Kansas, Los Angeles County Museum, Louisiana State University Museum of Zoology, Museum of Comparative Zoology - Harvard, Milwaukee Public Museum, Montana State University Museum, Michigan State University Museum, North Carolina State Museum of Natural History, Northern Louisiana University Museum, University of Colorado Museum, University of Georgia Museum of Natural History, University of Idaho Museum, University of Michigan Museum, University of South Dakota, United States National Museum of Natural History, University of Texas - Arlington, University of Texas - El Paso, and Peabody Museum - Yale. Most museum data were received with the help of Dr. Charles Peterson, Idaho State University, Pocatello.

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INTRODUCTION

Applications for permits to drill for gas on existing leases have been filed for public lands managed by the Lewis and Clark National Forest, Montana Department of Fish, Wildlife, and Parks, and the Great Falls Resource Area (Bureau Of Land Management). In order to better determine the possible results of potential drilling on wildlife in the study area, more information was needed on the presence and distribution of several special status species which included the northern bog lemming (*Synaptomys borealis*) and several amphibians and reptiles.

Amphibians and Reptiles

Many amphibians are apparently declining in the western U.S. and world-wide (Corn and Fogelman 1984, Yoffe 1992, Phillips 1990; Blaustein and Wake 1995). Acid rain, ozone depletion, pollution by toxic chemicals and heavy metals, predation and/or competition by exotic species, habitat alteration, climate change, disease, immune system problems, and some combination of these factors have all been suggested as possible causes (Corn and Fogelman 1984; Yoffe 1992; Phillips 1990; Blaustein et al. 1993, 1994a, 1994b, 1995, 1996; Blaustein and Wake 1995).

Bass and non-native trout have been introduced into waters on or near the Rocky Mountain Front and have been implicated in declines of native amphibian populations in some areas. Past forestry practices and large scale logging continue to be detrimental to resident herpetofauna in other areas (Bury *at al.* 1991). Preliminary data indicate the Northern Leopard Frog (*Rana pipiens*) has disappeared over much of its former range in western Montana and is declining in parts of eastern Montana (Hendricks and Reichel 1996a, 1996b; Reichel 1995a, 1995b; Werner and Reichel 1994, 1996). It was added to the Montana Natural Heritage Program Species of Special Concern list in 1997. The US Fish and Wildlife Service now lists the Western Toad (*Bufo boreas*) as a Candidate species in Colorado, Wyoming and New Mexico. Apparent declines have recently been reported in northern Idaho, northwest Montana, Yellowstone National Park, Wyoming, and Colorado (Carey 1993; Reichel and Flath 1995; Werner and Plumber 1994; Werner and Reichel 1994, 1996; Koch and Peterson 1995; C. Peterson pers. comm.). It was added to the Montana Natural Heritage Program Watch List in 1995.

The Montana Natural Heritage Program lists 5 amphibians [Coeur d'Alene Salamander (*Plethodon idahoensis*), Idaho Giant Salamander (*Dicamptodon aterrimus*), Canadian Toad (*Bufo hemiophrys*), Northern Leopard Frog, Wood Frog (*Rana sylvatica*)] and 5 reptiles [Snapping Turtle (*Chelydra serpentina*), Spiny Softshell (*Trionyx spiniferus*), Western Hognose Snake (*Heterodon nasicus*), Smooth Green Snake (*Opheodrys vernalis*), Milk Snake (*Lampropeltis triangulum*)] as Species of Special Concern in the state. In addition to the Species of Special Concern, the Watch List has 4 amphibians [Tailed Frog (*Ascaphus truei*), Great Plains Toad (*Bufo cognatus*), Western Toad, Great Basin Spadefoot (*Spea intermontana*)] and 2 reptiles [Northern Sagebrush Lizard (*Sceloporus graciosus*)Western Skink (*Eumeces skiltonianus*)] on it. Five of these species, the Tailed Frog, Western Toad, Plains Spadefoot, Northern Leopard Frog, and Western Hognose Snake occur or potentially occur on the Rocky Mountain Front study area.

Northern Bog Lemming

The northern bog lemming, a small, grayish brown, vole-like microtine, is related to the true arctic lemmings (*Lemmus*). Nine poorly differentiated subspecies are currently recognized (Hall 1981). The northern bog lemming has a total length of 118-140 mm including its very short tail (19-27 mm) (Banfield 1974, Hall 1981). The combination of a tail less than 28 mm long and a longitudinal groove in the upper incisors distinguish the northern bog lemming from all other mice found in Montana.

Little is known about northern bog lemming life history. Litter sizes vary from 3-8, with 2 (or more?) litters per year. It has been suggested that some animals breed the same year they are born (60-90 days old?). Such information is scattered throughout the literature. All literature specific to northern bog lemmings deals mainly with distribution; other publications mention lemmings only as a sidelight to the main publication.

The northern bog lemming is boreal in distribution, occurring in North America from near treeline in the north, south to Washington, Idaho, Montana, Minnesota, and New England. It typically inhabits sphagnum bogs and fens, but is also occasionally found in other habitats including mossy forests, wet sub-alpine meadows, and alpine tundra. One subspecies (*S.b. artemisiae*) lives on sagebrush hillsides in eastern British Columbia (Anderson 1932). Southern bog lemmings (*S. cooperi*) also inhabit a wide variety of habitats, all of which are marginal for voles (*Microtus* spp.); bog lemmings may be competitively excluded from better quality habitats by voles (Doutt *at al.* 1973, Linzey 1981). The northern bog lemming is rarely trapped and is one of the least known mice in North America. It is listed as a Species of Special Concern by the Idaho and Montana Natural Heritage Programs (Moseley and Groves 1990, Reichel 1997).

A few relict populations occur in the lower 48 states; the subspecies *chapmani* occurs in Montana, Idaho, and northeast Washington (Hall 1981). Bog lemmings are known from 4 locations in Idaho and 8 in Washington, all from within 80 km of the Canadian border (Johnson and Cheney 1953, Wilson *at al.* 1980, Reichel 1984, Groves and Yensen 1989, D. Johnson pers. comm.). The reasons for the disjunct nature of the populations may include: 1) the localized nature of its primary habitat; and 2) the currently patchy distribution of a boreal species that was more widely distributed during the Pleistocene (a glacial relict).

Prior to 1992, evidence of bog lemmings in Montana included: 1) 6 locations on the west side of Glacier National Park (Wright 1950, Weckwerth and Hawley 1962, Hoffmann *at al.* 1969, Pearson 1991); 2) Shoofly Meadows in the Rattlesnake drainage north of Missoula (Adelman 1979), and 3) a single skull recovered from a Boreal Owl (*Aegolius funereus*) pellet west of Wisdom (J. Jones pers. comm.); where the owl captured the lemming was unknown. In 1992 and 1993, 51 sites were trapped which located 10 new populations of northern bog lemmings (Reichel and Beckstrom 1993, 1994). The Maybee Meadows site, just west of Wisdom, is the southern-most known population of the species outside of New England and one of two Montana populations known from east of the Continental Divide. The other eastern site is from near Wood Lake, approximately 50 km south-south-west of the oil and gas leasing study area. All 10 sites found in 1992-1993 were associated with thick mats of moss.

METHODS AND MATERIALS

Amphibians and Reptiles

Historic locations of amphibians and reptiles were recorded from literature (see Bibliography) and museum specimen records. Records were received from over 20 major museum collections in North America (see Acknowledgments). Locations derived from these sources have been entered into a database and digitized.

Survey sites on the study area (Figure 1) were chosen based on 3 criteria: 1) location of streams, seeps and wetlands on topographic maps; 2) accessibility of the wetlands by roads or hiking trails; and 3) conversations with area biologists regarding stream-seep-wetland locations. Based on the above, 2-5 sites were chosen daily for surveys. Due to the relatively small size of the study area and the lack of water across much of the landscape, every known non-beaver pond, a sampling of beaver ponds within each drainage where they are known to occur, and a least 1000 m of most streams were sampled. A total of 10-1200 person-minutes were spent at each site, depending upon the size of the area and what was found. Initially, the entire shoreline, or a major part thereof, was searched by walking slowly along the edge and up into the surrounding vegetation, including rolling over rocks and logs. At regular intervals, the aquatic habitat was sampled for tadpoles or larvae using dipnets. If the initial sampling showed amphibian/reptile species present, further effort was expended in order to get some idea of abundance and distribution.

An attempt was made to capture at least the first few individuals of a species seen at a survey site. The species name was recorded along with developmental stage and sex (if possible); the animals were then released. Representative samples of the more common species in an area were preserved for permanent museum records and will be deposited at the Idaho State University Museum. Water temperature, air temperature, pH, a general description of the area, and other parameters were recorded. Standard data sheets used during this project are given in Appendix 1; the amphibian survey data sheet was developed by U.S. Fish and Wildlife Service and is used extensively by a variety of researchers in the western U.S. Much site-specific data was gathered during these surveys; not all data has been analyzed or is presented in this report, but is available from the Montana Natural Heritage Program.

Northern Bog Lemming

I visited 18 sites on the study area along the Rocky Mountain Front during amphibian and reptile surveys, and examined each to determine their suitability for northern bog lemmings. The only site within the study area that appeared even marginally suitable was the fen on the Blackleaf Wildlife Management Area (WMA). Some sites examined were suggested by biologists and others from the cooperating agencies; others were identified while in the field or by examining air photos or maps of the general area.

During 10-12 September 1996 Museum Special snap-traps were used to sample Blackleaf Fen (T26N R8W Section 29 NE ¼ and Section 28 NW ¼) and a small area on nearby Pine Butte Swamp (T24N R8W Section 13 NE ¼). Traps were baited with a combination of peanut butter and rolled oats, either alone or with E. J. Dailey's muskrat lure. Two traps with different baits

were placed within 2 m of each other at each station. We placed each trap at a station to maximize success (runway, burrow, etc.). Stations were placed 5-30 m apart.

Trapping effort ranged from 227 to 230 trap-nights over 2 nights. A trap-night constitutes one trap set for one 24-hour period (traps sprung and empty, or completely missing, are not counted). All small mammals trapped were donated to the University of Montana Museum and will be prepared as study skins and/or skulls.

RESULTS AND DISCUSSION

Amphibians and Reptiles

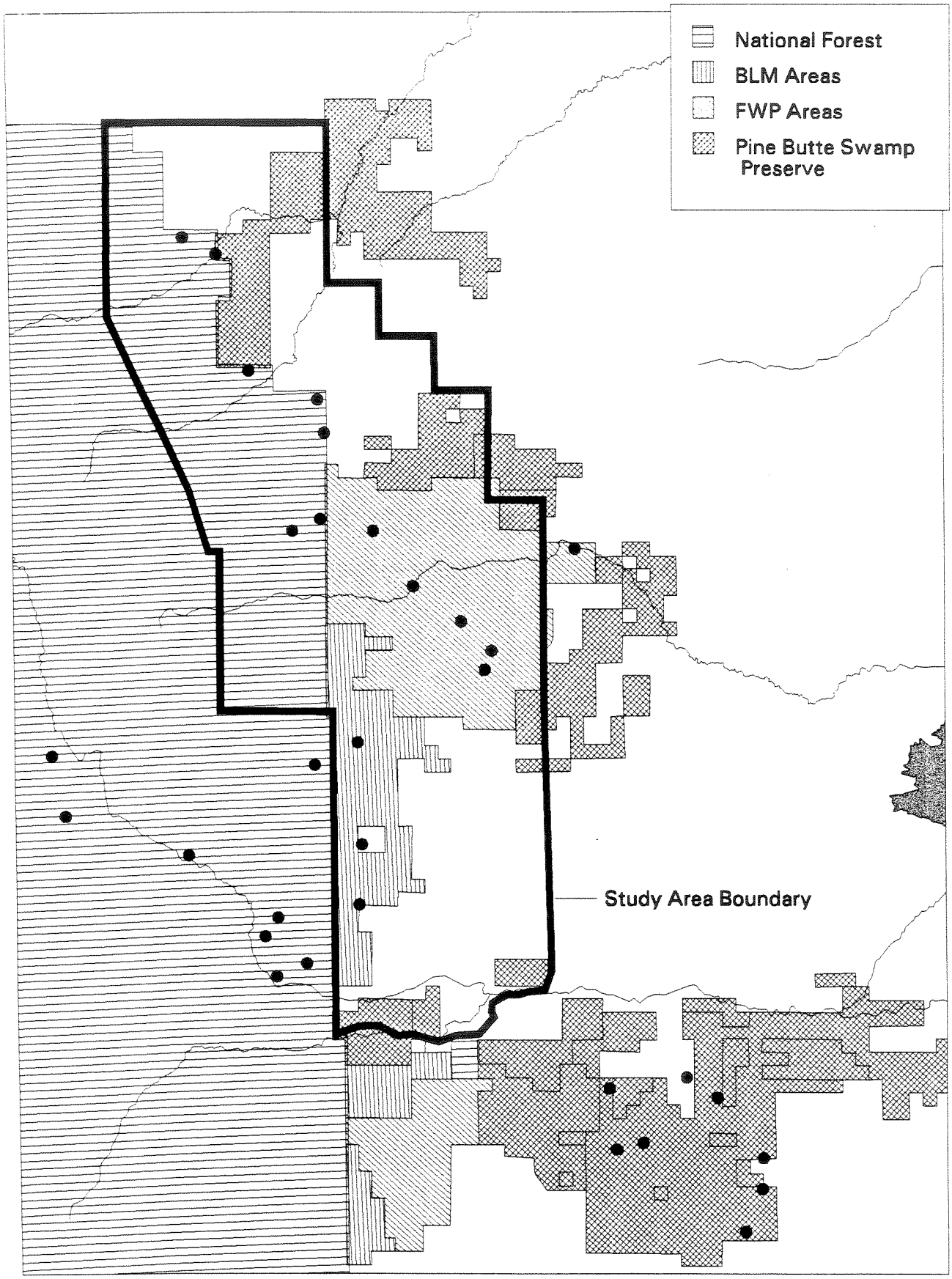
A total of 18 sites were surveyed for amphibians and reptiles of which only 5 had one or more amphibian or reptile species present (Figure 1, Appendices 3 and 4). Many of these surveys, although represented by a single dot on Figure 1, actually covered large areas (e.g. the entire Blackleaf Fen) and 1000-2000 m of streams. Although no species were found at 13 sites, their absence may have been due to the time of day, weather conditions, sampling too late in the season for some species, or other factors at the time of sampling.

In addition to the 18 sites surveyed for amphibians and reptiles, there were a number of sightings (i.e. road kills, chance observations) for which data are available and the sightings considered reliable. Species location data from surveys, chance encounters, and historic records (from the literature and museum specimens) are listed in Appendix 5. Distribution maps were created using survey and sighting data and historical records; inset statewide maps for each species are based on sight and specimen records, both recent and historic.

A 1995 report (Reichel 1995a) concentrated on reptiles and amphibians on the L&CNF; it was not specific to the Rocky Mountain Front area, however, and no surveys were done within the study area. There is also a publication on the Tiber Reservoir area to the northeast (Mosimann and Rabb 1952). No museum specimens, publications, previous surveys or previous incidental observations are known from the study area. Three amphibian and two reptile species were actually observed during the study, while an additional 5 amphibians and 8 reptiles may eventually be found to occur there. The study area is very arid, with many of the streams disappearing underground for long distances by mid-summer and many ponds drying up. Even most of the streams with water were characterized by very low flows in a wide gravel bed, and lacked stream side vegetation, making them unsuitable for most amphibians. The only snakes found were garter snakes, possibly due to the short growing season. Reptile reproduction is closely tied to environmental conditions, and in the cold climate of the Rocky Mountain Front, it is possible that many species just cannot reproduce successfully. The following results are presented as a species summary for the study area.

In the following species accounts, the section on "Similar Species" covers species only which are known or suspected to occur in Montana; outside Montana other confusing species may occur which are not covered in this report. Descriptions and photos of adults of all Montana amphibians and reptiles may be found in Reichel and Flath (1995). Potential surveying techniques, and their effectiveness, are summarized in Appendix 2 and are described in more detail for each species in Reichel (1995a).

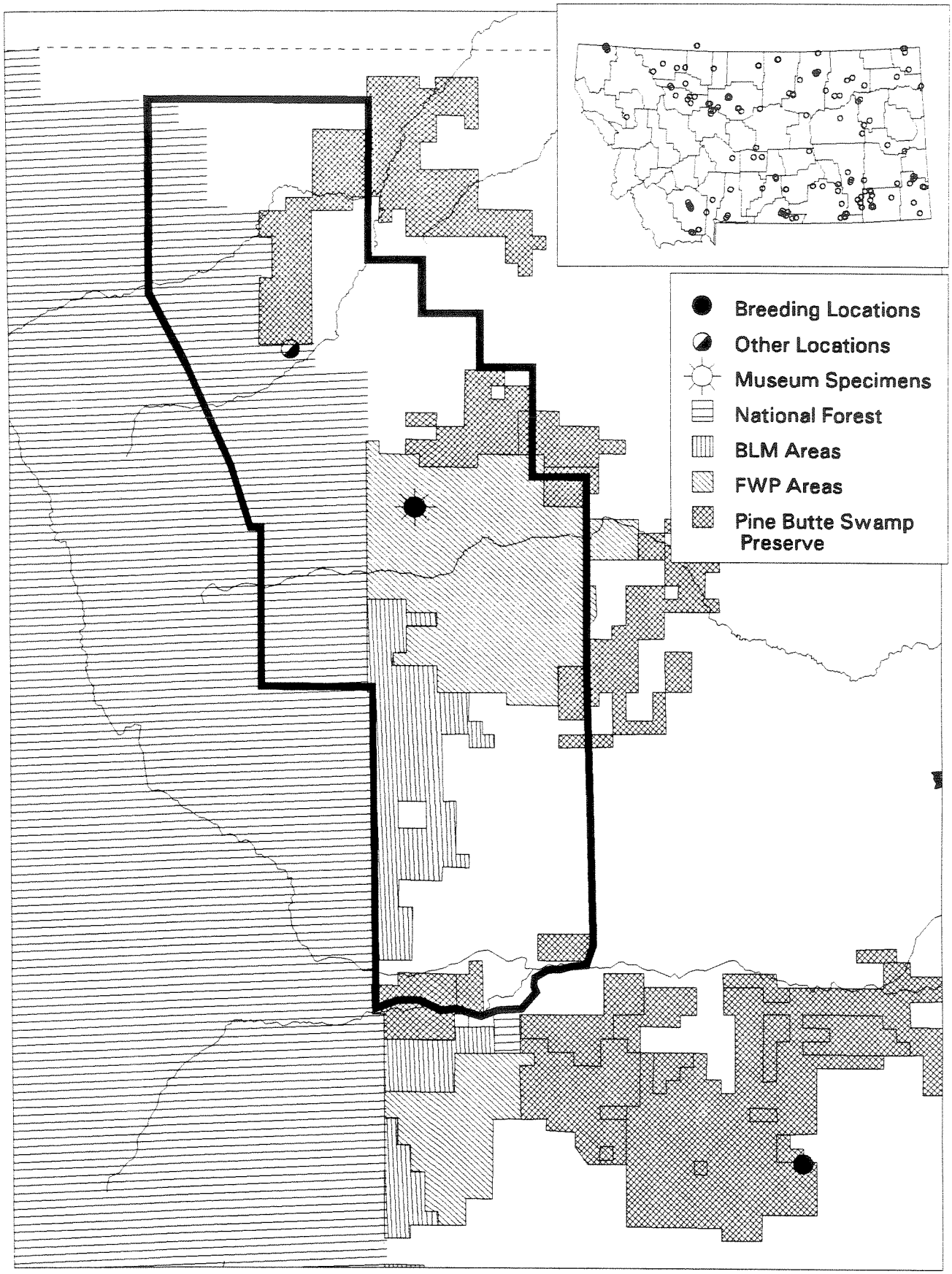
Figure 1. Study area and herp survey locations on the Rocky Mountain Front



Montana Natural Heritage Program, June 18, 1997

AMBYSTOMA TIGRINUM -- TIGER SALAMANDER

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAAAA01140

Amphibians and reptiles known to be present on the Rocky Mountain Front Oil and Gas Leasing Study Area

Tiger Salamander (*Ambystoma tigrinum*)

Description: Adults have a smooth moist skin without scales and the color pattern is highly variable; usually the background color is dark, with lighter blotches of yellow, tan or green. The adult is large and heavy-bodied with a snout-vent length of 3-6".

Eggs and Larvae: Egg masses are typically laid in small clusters of 5-120, but may be laid singly (Nussbaum *at al.* 1983, Leonard *at al.* 1993). They are usually attached to vegetation and placed 2"-10" below the surface of the water (Hammerson 1982a). Larval Tiger Salamanders are typically pale green or brown-colored, though some are nearly white in bentonite clay ponds. They are found in lakes and ponds, have external gills, and are relatively large (0.75-4" snout-vent) and heavy-bodied.

Similar species: Very small larval Tiger Salamanders may be confused with Long-toed Salamanders, however Tiger Salamander larva have short, broad, blunt toes, while Long-toed Salamanders have long, thin, pointed toes.

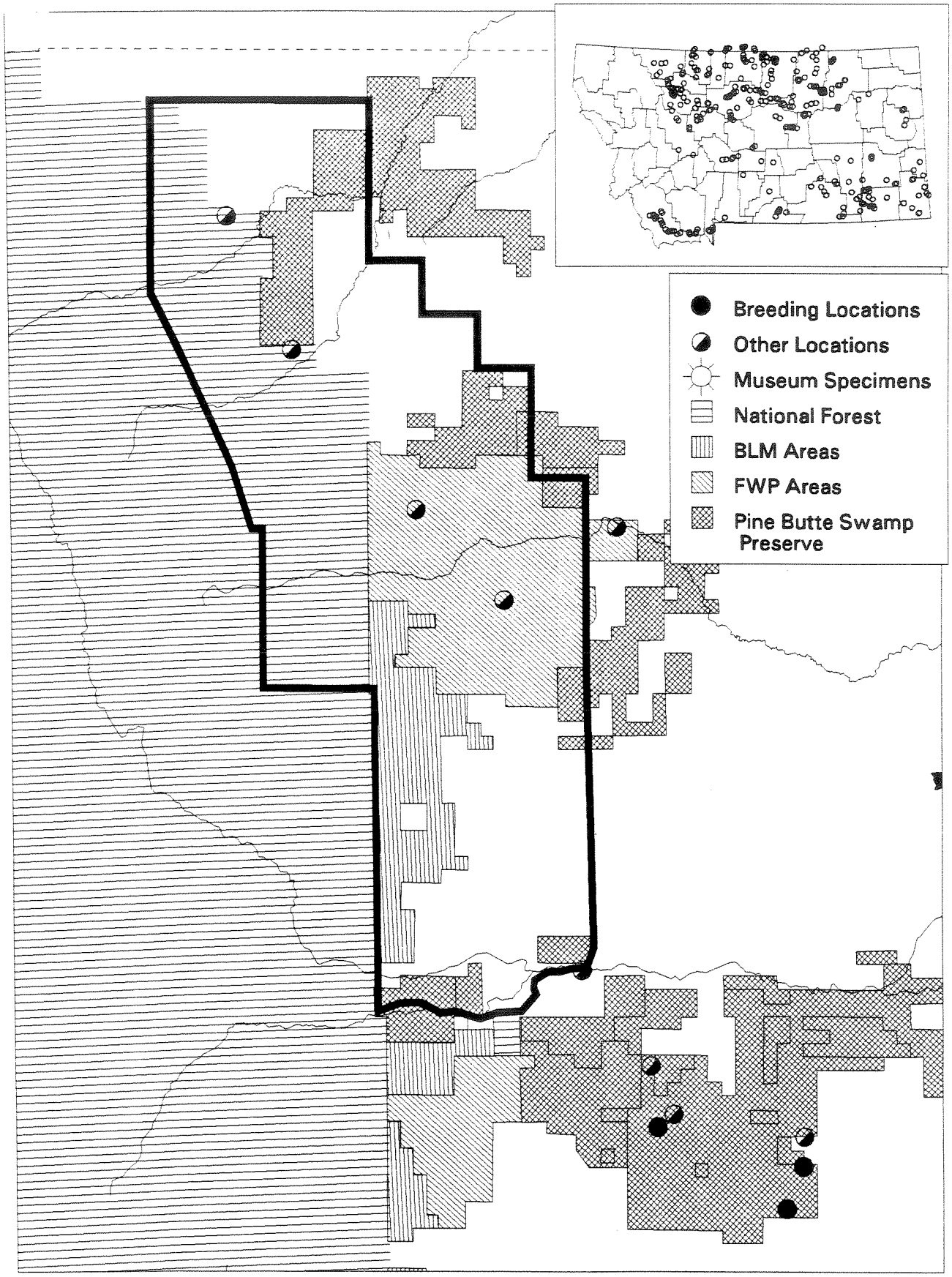
Habitat and Habits: In the study area, Tiger salamanders were found in two ponds. In one, a single adult was captured and in the other, large larvae were found on 29 May 96; it seems likely that they overwintered in the pond. Both ponds were in somewhat open timber. Tiger Salamanders are primarily associated with prairie or agricultural habitats in eastern Montana. They breed in ponds or lakes, usually those without fish present. In arid areas they may also be found in springs, intermittent streams, and stock ponds. In Blue Lake, Madison County, Montana, eggs are laid from early June to mid-August, hatched in about 2 weeks, and metamorphosed after more than a year (Micken 1968, 1971). In Colorado and Wyoming egg laying takes place from mid-March to mid-August (Hammerson 1982a, Baxter and Stone 1985). Eggs hatch in 2-5 weeks in Colorado and metamorphosis occurs after 2-24 months (Hammerson 1982a). Following breeding, adults may remain in the pond or may move to upland areas and live in burrows of their own or in those of other animals. In some locations, such as Blue Lake in Madison County, larval salamanders never transform, but rather become sexually mature and breed while still retaining external gills. This process is referred to as neoteny and these salamanders are called "axolotls" or "water dogs."

Status: The most common salamander in eastern Montana. They are likely to occur more commonly on the study area and are also known from Pine Butte Swamp Preserve, just to the south. They should be looked for in low elevation ponds and lakes, particularly those without fish and within grassland habitats. This is the first documented record of this species on the L&CNF.

Montana Natural Heritage Program rank: G5 S5.

PSEUDACRIS TRISERIATA -- WESTERN CHORUS FROG

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAABC05070

Western Chorus Frog (*Pseudacris triseriata*)

Description: Adults are very small (0.75-1.5") and have tiny, almost unnoticeable toe pads. They have a dark line extending from the snout through the eye to the groin. Basic coloration is quite variable with the background color being green, brown, gray, or reddish. Typically 3-5 dark longitudinal stripes are present on the head and back which may be broken up into spots on some individuals.

Eggs and Tadpoles: Eggs are laid in small clusters of 10-100, usually less than 1" across and attached to submerged vegetation (Wheeler and Wheeler 1966, Baxter and Stone 1985). Individual eggs are about 1 mm in diameter. Tadpoles are brown/bronze and the eyes are located on the sides of the head.

Similar species: Recently metamorphosed Ranid frogs could be confused with this species but the coloration differs and the tiny toe pads are lacking.

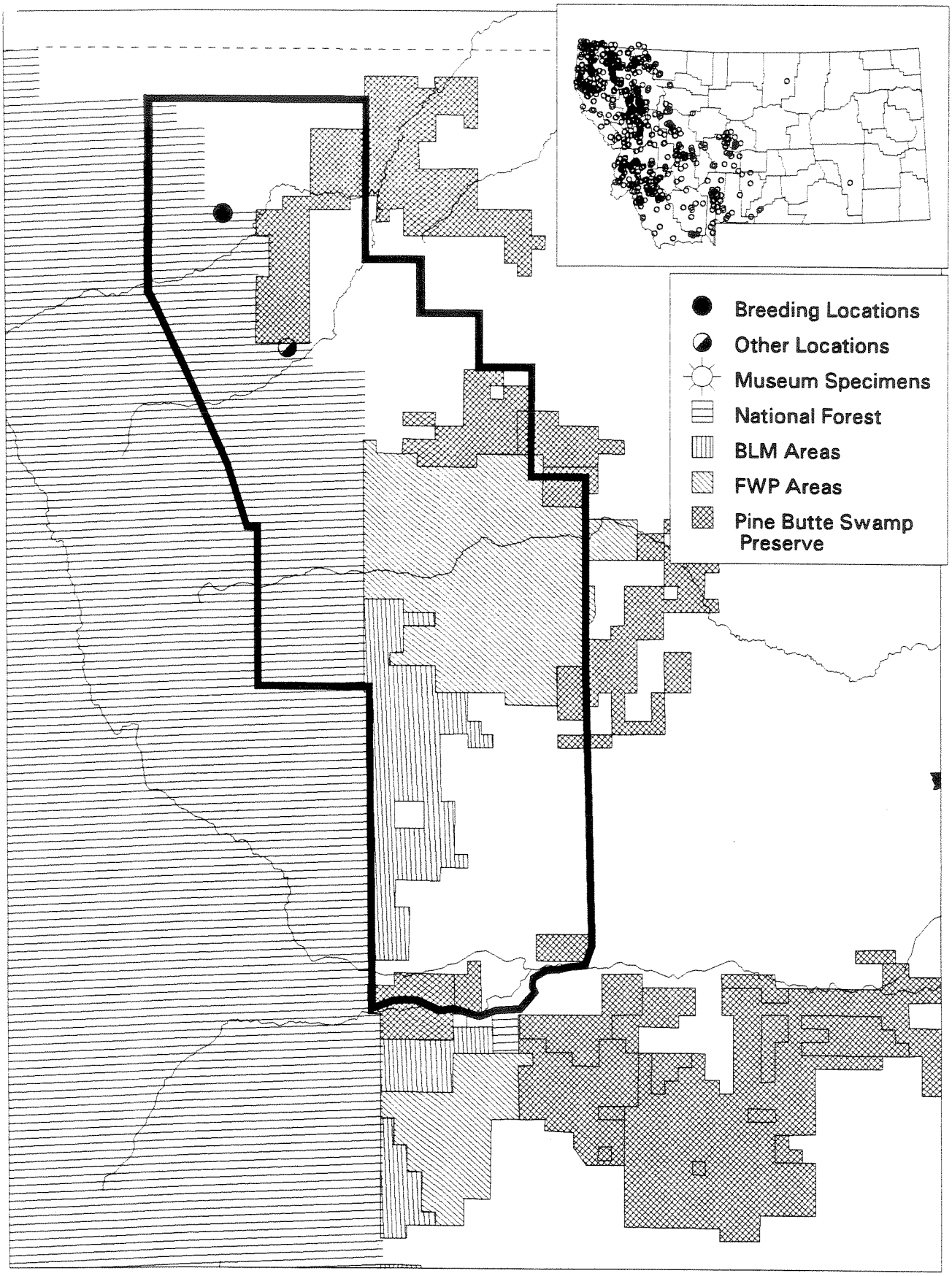
Habitat and Habits: Adult Western Chorus Frogs are regularly found in the water only during the breeding period in spring. Their presence is obvious during this time due to their call which is given frequently at night and sporadically throughout the day. Calls were heard on the study area during surveys in late-May; however, the precise beginning and end of the calling season in the area is unknown. They had apparently not yet laid eggs by late May, but any tadpoles that were present had metamorphosed by mid-August. Following breeding, these frogs move into adjacent uplands and are rarely seen. Western Chorus Frogs were found on the study area in ponds located both in the prairie and open-forest habitat. Throughout eastern Montana they breed in temporary ponds and small lakes surrounded by prairie; in a few other locations in Montana they are also found in open forested habitats. Eggs hatch in about 2 weeks and tadpoles are about 2 months old at metamorphosis (Wheeler and Wheeler 1966, Nussbaum *at al.* 1983).

Status: Western Chorus Frogs appeared to be the most common amphibian on the study area. They can be expected to occur in most ponds in prairie habitat, and at some ponds within the forest matrix, becoming rapidly less common to the west. None are known to occur in forested habitat more than 10 km from the prairie-forest ecotone. Common throughout the prairies of eastern Montana.

Montana Natural Heritage Program rank: G5 S5.

RANA PRETIOSA -- SPOTTED FROG

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAABH01180

Spotted Frog (*Rana pretiosa*)

Description: The adult has a snout-vent length of 2-4". Adults are dark to light brown, gray, or olive green with dark spots (frequently with lighter centers) found on the back, sides and legs. The number and pattern of spotting is quite variable. The back and sides are often covered with small bumps. The underside of the legs is bright red, salmon, or orange; this bright color may extend up to the chin or be replaced by a light, mottled gray on the chin, chest, and/or belly. In younger subadults, bright leg color is often lacking and instead a light, lemon-colored wash is present. In these subadults there is often a dark mask present, with a light jaw stripe extending to the shoulder; both the mask and jaw stripe may be less obvious in larger, older animals.

Eggs and Tadpoles: Eggs are laid in large, globular masses of 150-500 at the surface of the water. The tadpoles are dark green to brown on top with some gold flecking whereas the underside has an iridescent bronze or silver color. Total length of tadpoles may reach 3"; the eyes are located on top of the head.

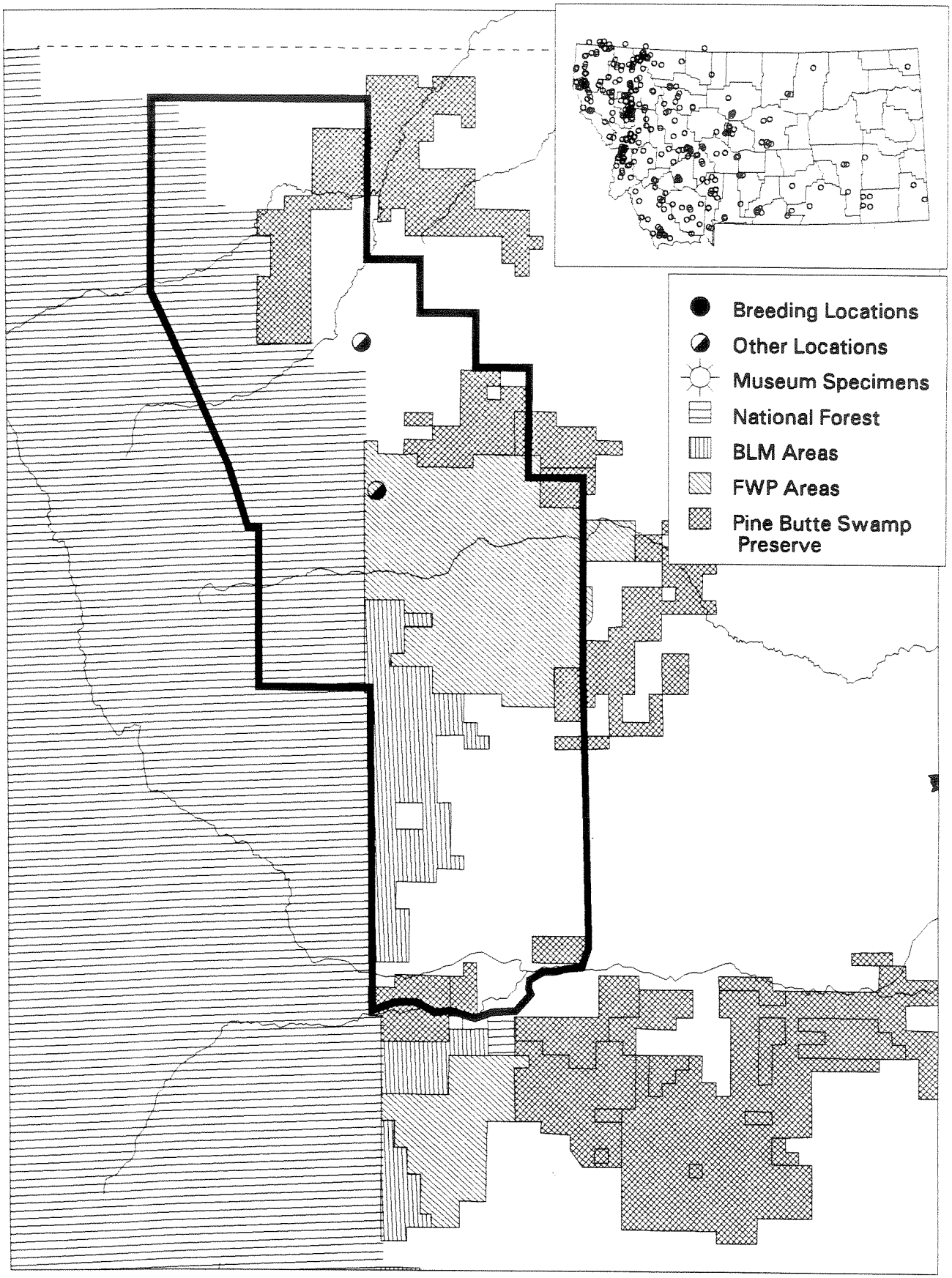
Similar species: The bright-colored pigment on the undersides of the adult's legs distinguish this species from all other frogs in Montana. Younger individuals, without colored legs, may usually be distinguished from other frogs by a combination of: 1) dorsal spots usually present but not surrounded by light-colored halos; 2) dorsolateral folds present; 3) toes without pads at the tips; and 4) a pale gray, (rather than white) belly.

Habitat and Habits: Spotted Frogs are regularly found at the water's edge in openings within forest habitats. Wetlands in or near treeline are also used, but populations are uncommon in the large, open intermountain valleys. The Spotted Frog was found at only two ponds on the study area, despite the ease of surveying for this species. It is apparently uncommon on the study area, probably due to the scarcity of permanent ponds in a forest landscape and the ephemeral nature of many of the streams. Across western Montana, breeding takes place in lakes, ponds (temporary and permanent), springs, and occasionally backwaters or beaver ponds in streams. All the egg masses in a particular pond are often found in the same location at the margin of the pond; therefore, the eggs are susceptible to drying up if pond levels recede substantially before hatching. The only tadpoles observed were found 31 May 96 at a pond near the North Fork of Dupuyer Creek. Previous surveys on the L&CNF indicated that tadpoles in this area metamorphosed beginning in late July. Throughout their range, Spotted Frog eggs hatch in 2-3 weeks and tadpoles take 2-14 months to metamorphose, depending on water temperature (Nussbaum *at al.* 1983, Turner 1958). Young and adult frogs often disperse into marsh and forest habitats but are not usually found far from open water.

Status: The most common frog in western Montana, there are no indications of declines in the state. It was observed on the study area, however only a single breeding location is known at this time and, if new ones are found they should be reported. It was not seen outside of forested habitat. Significant declines are known from the southern end of the range (Nevada, southern Idaho, Utah). While significant declines are also apparent in coastal Washington (McAllister *at al.* 1993), Oregon, and California, recent research indicates that those populations are actually a different species (Green *at al.* 1996, 1997); if that taxonomic arrangement is accepted, the frog here in Montana will become the Columbian Spotted Frog (*Rana luteiventris*).

THAMNOPHIS ELEGANS -- WESTERN TERRESTRIAL GARTER SNAKE

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADB36050

Montana Natural Heritage Program rank: G4 S4.

Western Terrestrial Garter Snake (*Thamnophis elegans*)

Description: Adult Western Terrestrial (or Wandering) Garter Snakes are smaller in body size than the Common Garter Snake, their length varying from 18-43". Three yellow longitudinal stripes are present (one dorsal, two lateral), but the dorsal stripe is much narrower than that of the Common Garter Snake. A distinctive feature of the Western Terrestrial Garter Snake is a series of alternating black spots which run the length of the body between, and somewhat on, the yellow stripes. The background color between the stripes tends to be more gray compared to the dark brown found in the Common Garter Snake. The ventral surface has a series of dark black/brown blotches which may cover most of the surface. The dorsal scales are keeled and there are normally 8 upper labial scales.

Young: The coloration of young snakes is similar to that of the adults; young are live-born.

Similar species: See Common Garter Snake.

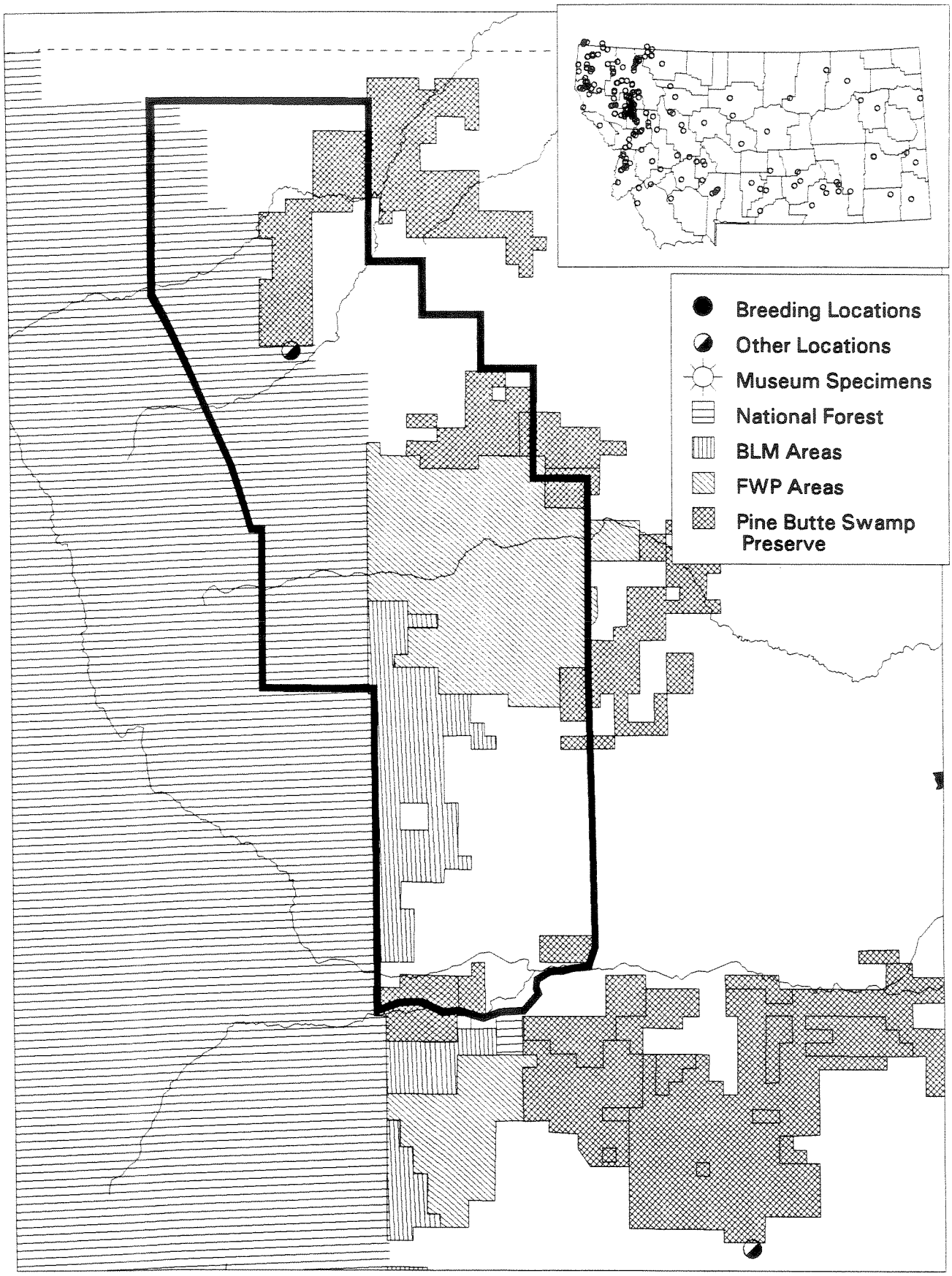
Habitat and Habits: The habitat and habits of the Western Terrestrial Garter Snake are similar to the Common Garter Snake, i.e., they are found in most habitats but are particularly common around wetlands. On the study area both were seen sunning themselves on roads; one was just above Dupuyer Creek, one just above Blackleaf Creek. Females give birth to 4-19 young during the summer (Stebbins 1985).

Status: Western Terrestrial Garter Snakes are typically most common garter snake in the western half of Montana. They are present on the study area and are probably found throughout the area near water. Of particular interest would be the documentation of any denning areas located.

Montana Natural Heritage Program Rank: G5 S5.

THAMNOPHIS SIRTALIS -- COMMON GARTER SNAKE

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADB36130

Common Garter Snake (*Thamnophis sirtalis*)

Description: The Common Garter Snake consists of two color phases in western Montana, both ranging from 18-52" in length. Both phases have three yellow longitudinal stripes: one located dorsally and one on each side. Between the yellow stripes is a black stripe broken with red spots in one color phase but lacking red in the other. Ventral coloration varies from yellow to bluish, and some individuals of the red-sided color phase have small black spots on the edge of the ventral scales. The dorsal scales are keeled, and normally there are 7 upper labial scales.

Young: The coloration of young snakes is similar to that of the adults; young are live-born.

Similar species: The Western Terrestrial Garter Snake has black spots overlapping the dorsal yellow stripe; the background color between stripes tends to be brownish. The Plains Garter Snake has the lateral yellow stripes on the 3rd and 4th scale rows above the belly scales and the dorsal stripe is nearly always orange or rust-colored.

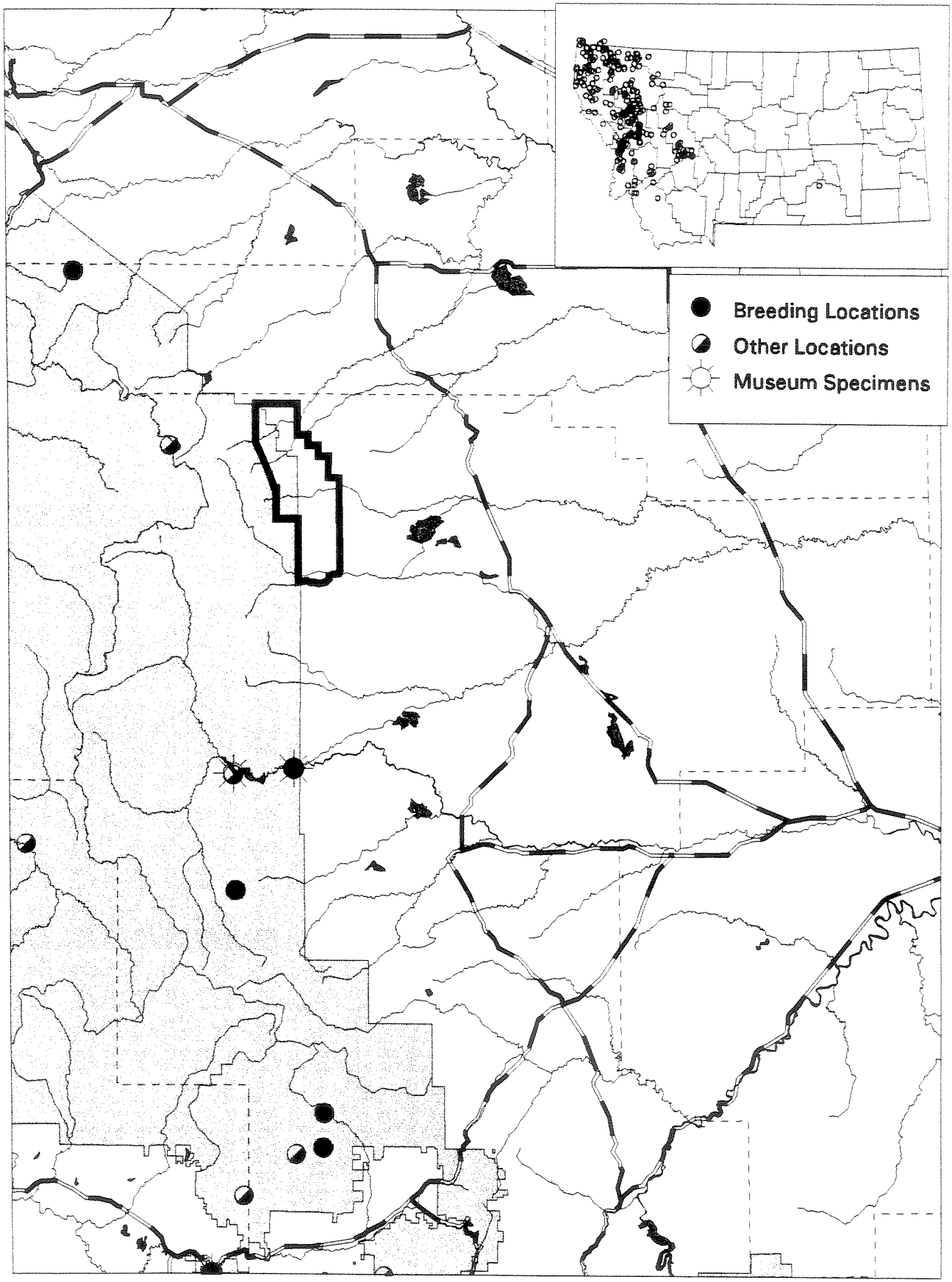
Habitat and Habits: Garter snakes are found in all forest habitats but are more common at lower elevations around marsh-bog-pond situations, where they prey on young fish, frogs, toads, mice and invertebrates. One was found on the study area in an ephemeral pond. Typical of most garter snakes, they emit a noxious secretion when handled and can be aggressive when disturbed. Garter snakes eat a variety of vertebrates and invertebrates, with the Common Garter Snake concentrating more on amphibians than the Western Terrestrial Garter Snake. The Common Garter Snake is a live-bearer giving birth to 12-18 young during the summer in Colorado (Hammerson 1982a).

Status: A single Common Garter Snakes was found on the study area. Given the small number of records from throughout the area, all records should be documented until the distribution is better understood; of particular interest would be documentation of denning sites. Only the red-sided color phase was observed in the present survey, however the color phase lacking red spots should be watched for. The relative abundance of this species in this area compared to the Western Terrestrial Garter Snake is not yet clear; in northwestern Montana the Common Garter Snake is currently much less abundant.

Montana Natural Heritage Program Rank: G5 S4.

AMBYSTOMA MACRODACTYLUM -- LONG-TOED SALAMANDER

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAAAA01080

Amphibian and reptiles potentially present on the Rocky Mountain Front Oil and Gas Leasing Study Area

Long-toed Salamander (*Ambystoma macrodactylum*)

Description: Adults are dark gray to black with an irregular (and sometimes broken) green to yellow stripe down the middle of the back. Adult snout-vent length varies from 2 to 3.25". All salamanders have smooth moist skin without scales.

Eggs and Larvae: Egg masses are typically laid in small clusters of 5-100 eggs but may be laid singly (Nussbaum *at al.* 1983). Within the clear gelatinous eggs, the embryos are somewhat light-colored, while frog and toad embryos are dark (except in Tailed Frogs). Larval Long-toed Salamanders are typically brown- or gray-colored, are found in ponds, have three external gills, and are relatively small (<1.75" snout-vent) and slender. They are distinguished from Tiger Salamander larvae by the 9-13 gill rakers on the inside of the 3rd gill arch (17-22 rakers on the Tiger Salamander); they are also smaller and lack the large head and mouth.

Similar species: Adult Long-toed Salamanders can be distinguished from Coeur d'Alene Salamanders by the longest toe on the hind foot which is longer than the sole. Long-toed Salamanders lack a groove running vertically from nostril to mouth and a yellow throat patch. Also see Tiger Salamander.

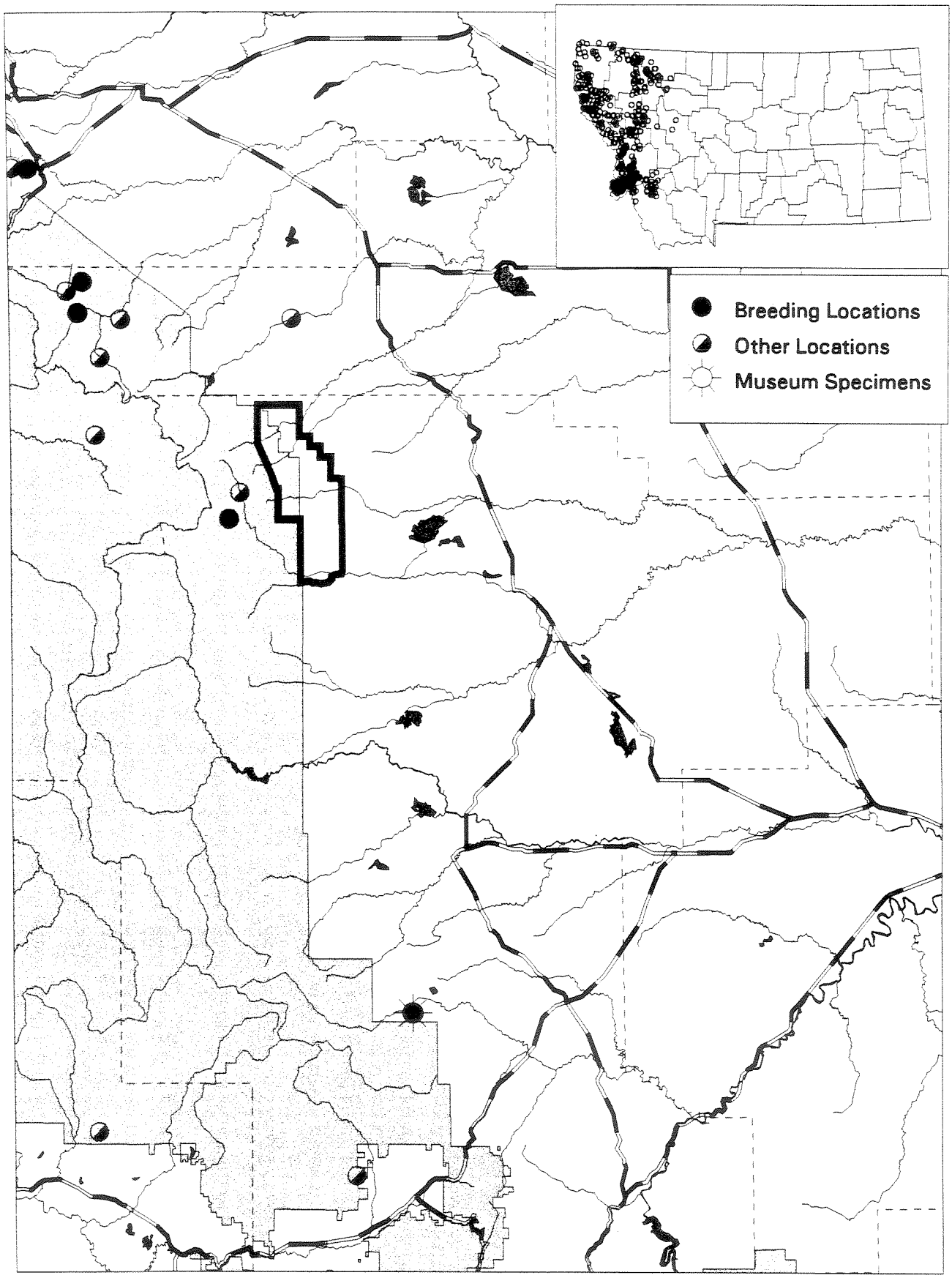
Habitat and Habits: Long-toed Salamanders are found in a wide variety of habitats from sagebrush to nearly alpine. They breed in ponds or lakes (very rarely in slow moving streams), usually those without fish present. Adults go to the breeding ponds immediately after snow-melt and are usually the earliest breeding amphibians in western Montana. In the Pacific Northwest, eggs hatch in 3-6 weeks and metamorphosis occurs after 2-14 months (Nussbaum *at al.* 1983, Leonard *at al.* 1993). On the L&CNF and vicinity, the earliest observation was of three egg masses nearly ready to hatch and about 500 recently-hatched larvae in a marshy, backwater pond off Wood Creek on 27 May 1994. A mid-sized larva was also seen in a beaver pond in Wagner Basin on 5 July 1994. Individuals were found in the Rocky Mountain Ranger District (RMRD) from 4600 - 5720 ft. elevation. They typically co-occurred with the Spotted Frog.

Status: The Long-toed Salamander is the most common salamander in western Montana. Preliminary indications are that the Long-toed Salamander is uncommon and locally distributed in the vicinity of the study area on the RMRD of the L&CNF, the eastern edge of its range. Very few suitable ponds or lakes occur in the study area itself, and several of those have Tiger Salamanders present; Long-toed Salamanders are not known to co-occur with Tiger Salamanders at any location. Although it is possible that a population of Long-toed salamanders exists on the study area, it seems unlikely at this point.

Montana Natural Heritage Program rank: G5 S5.

ASCAPHUS TRUEI -- TAILED FROG

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAABA01010

Tailed Frog (*Ascaphus truei*)

Description: Adults are gray or brown with gray, brown, or occasionally yellow blotches; the skin has a distinctly bumpy texture. The adult has a snout-vent length of 1.5-2" and lacks a tympanum. The outer toe of the hind foot is broader than the other toes. The male has a bulbous "tail" which acts as a penis.

Eggs and Larvae: Approximately 50 eggs are laid in rosary-like strings attached to the underside of rocks. The tadpole (up to 2" long) is unique in that it has a large mouth modified into a sucker; the color is quite variable.

Similar species: No other frog or toad has the outer toe of the hind foot broader than the other toes; all other frogs and toads have a tympanum behind each eye.

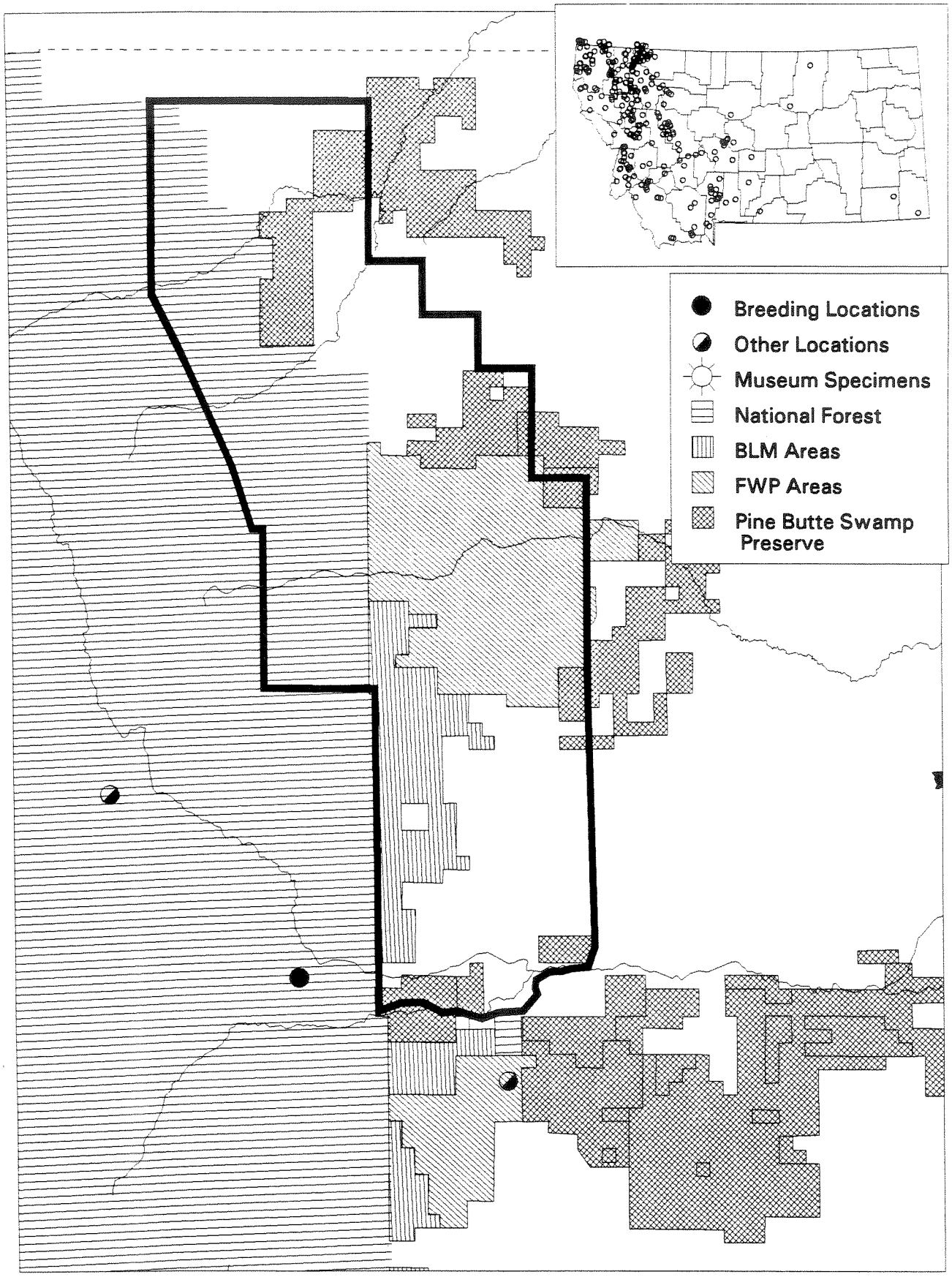
Habitat and Habits: Tailed Frogs are found in and along small, swift, cold mountain streams. In the L&CNF, they have been found only on the RMRD in four locations, and none on the study area. The elevations range from 4900 feet in Falls Creek to about 6000 feet in a small stream on the Mount Wright trail. This elevation range will likely increase with additional sightings from the area. In the Cascade Mountains of Washington and Oregon, the Tailed Frog appears to be very sensitive to siltation and frequently disappears in and downstream from clearcuts and water diversions (Bury, pers. comm.). Preliminary findings do not indicate that this is the case in Montana. Eggs are laid during the late summer and take approximately 4 weeks to hatch. Tadpoles take 1-4 years to metamorphose, depending on water temperature (Nussbaum *at al.* 1983; Metter 1967). Sexual maturity in Montana is attained at 6-7 years old, (Daugherty and Sheldon 1982) which is the latest age for sexual maturity of any North American amphibian.

Status: Tailed Frogs were not found in any streams on the study area, however, they are known from a small tributary to the West Fork Teton River a few miles west of the study area. They are known from only a few locations east of the Continental Divide on the L&CNF and Beaverhead National Forest. Many of the streams on the study area periodically dry up, which would not allow Tailed Frogs, with their multi-year tadpole stage, to survive. They may still be found to occur in the upper reaches of some streams on the study area, if any flow year-long during drought years. While Tailed Frogs should be considered a species with a very localized distribution on the RMRD of the L&CNF, it may be more common and widespread in suitable habitat than is currently known. It is common and widespread in western Montana. Due to declines in the Cascade Mountains apparently related to logging, the Tailed Frog is currently on the Watch List of the Montana Natural Heritage Program.

Montana Natural Heritage Program rank: G5 S3S4. Watch List.

BUFO BOREAS -- WESTERN TOAD

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAABB01030

Western Toad (*Bufo boreas*)

Description: Adults are colored with a gray, brown, or olive-green mottling and a prominent white or yellowish line down the center of the back; very young transformed toads typically lack the dorsal line, and the warts are often red-brown in color. The pupils are horizontal. The adult has a body length of 2.5-5". There are no cranial crests and the skin is relatively dry with many warts and glands present.

Eggs and Larvae: Eggs are laid in long, clear, double strings, and each has a black embryo. Tadpoles are typically jet black, while all the Montana frog species tadpoles are green or bronze (except for some Tailed Frogs).

Similar species: Other Montana toads have cranial crests between their eyes. The Plains Spadefoot has one tubercle on the sole of the hind feet, a vertical pupil, and smoother skin. NOTE: It is very difficult to distinguish among the four Montana toad species in recently-transformed toadlets.

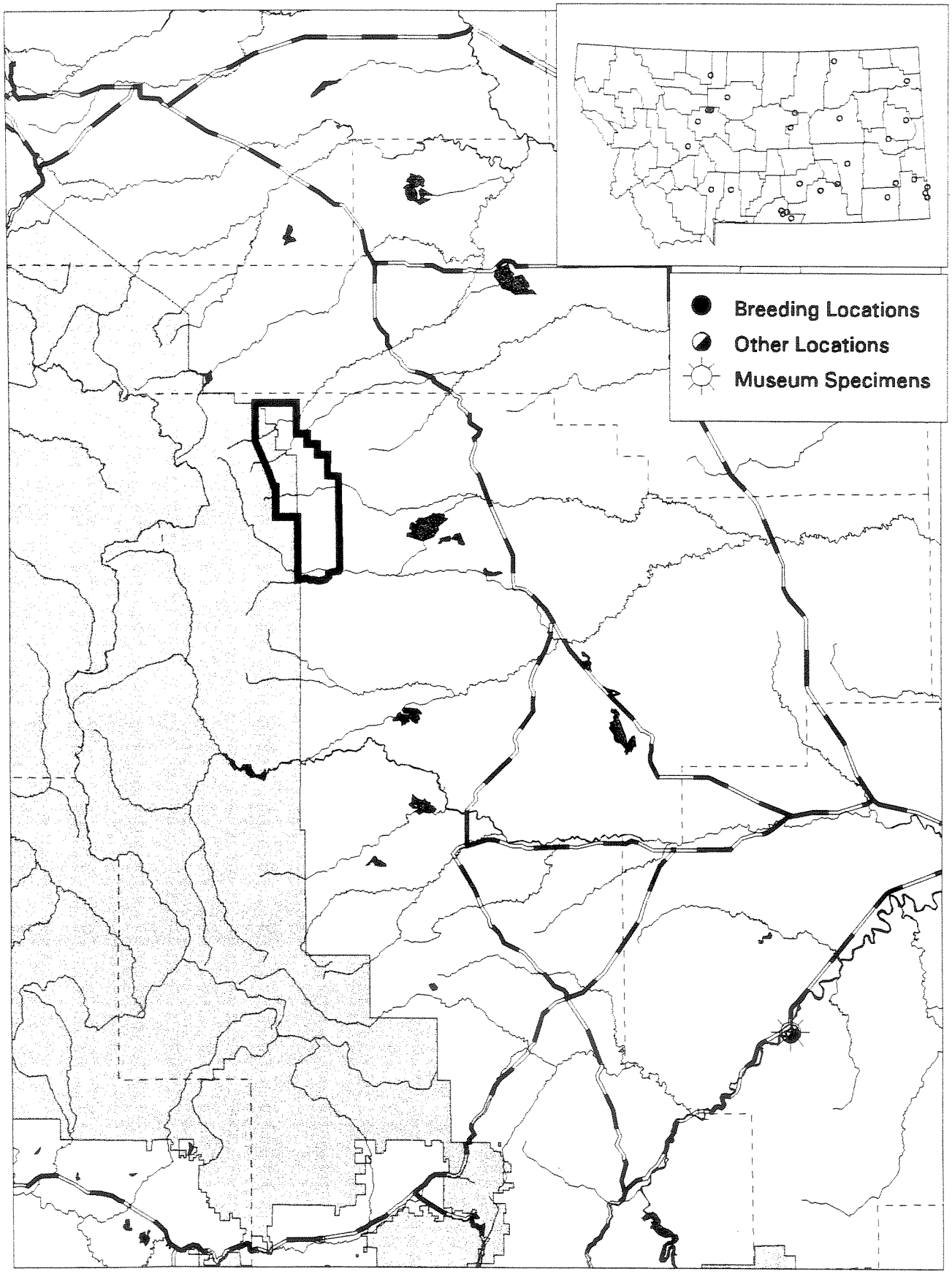
Habitat and Habits: Adults are largely terrestrial and found in a variety of habitats from valley bottoms to high elevations; they breed in lakes, ponds, and slow streams with a preference for shallow areas with mud bottoms. Breeding and egg laying in Montana usually takes place 1-3 months after snow-melt, from April at lower elevations to July at higher sites. On the L&CNF in 1994 we found eggs in a beaver pond on a backwater of the Teton River on 26 May 1994; one clutch was about half developed the other two recently laid. Tadpoles are typically 2-3 months old at metamorphosis in Montana, depending on water temperature (Black 1970). Following metamorphosis, hundreds of small toads, many with the tails still present, can be found on the shores of breeding ponds.

Status: None were seen in the study area. Tadpoles and eggs of the Western Toad were observed at only one site during the 1994 survey in the L&CNF, in the Teton River just to the southwest of the study area. The rarity of this species on the RMRD and lack of recent sightings in the outlying eastern ranges is of concern (Reichel 1995a). The U.S. Fish and Wildlife Service now lists this species as a Candidate species in Colorado, Wyoming, and New Mexico. Apparent declines have recently been reported in northern Idaho, western Montana, Yellowstone National Park, Wyoming, and Colorado (Peterson *at al.* 1992; Carey 1993; Werner and Reichel 1994, 1996; Hendricks and Reichel 1996a; Koch *at al.* 1995). We would recommend that all sightings of this species be reported and that breeding locations are periodically resurveyed. Due to declines in Montana and elsewhere across its Range, the Western Toad is currently on the Watch List of the Montana Natural Heritage Program.

Montana Natural Heritage Program rank: G4 S4. Watch List.

SPEA BOMBIFRONS -- PLAINS SPADEFOOT

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAABF02010

Plains Spadefoot (*Scaphiopus [=Spea] bombifrons*)

Description: Adults are colored gray or brown with darker mottling on the back and a white belly. Some individuals have indistinct longitudinal streaking. The pupils of the Plains Spadefoot are vertically elliptical and there is a high, hard lump between the eyes. Its skin is less warty than true toads. The adult has a single tubercle on the hind feet and has a body length of less than 2.5".

Eggs and Tadpoles: Oval egg masses of 10-250 eggs are attached to underwater plants or debris. Tadpoles are mottled sooty and olive-yellow above and paler below with gold metallic flecking over all; iris is gold.

Similar species: Other Montana frogs and toads have round or horizontally elliptical pupils.

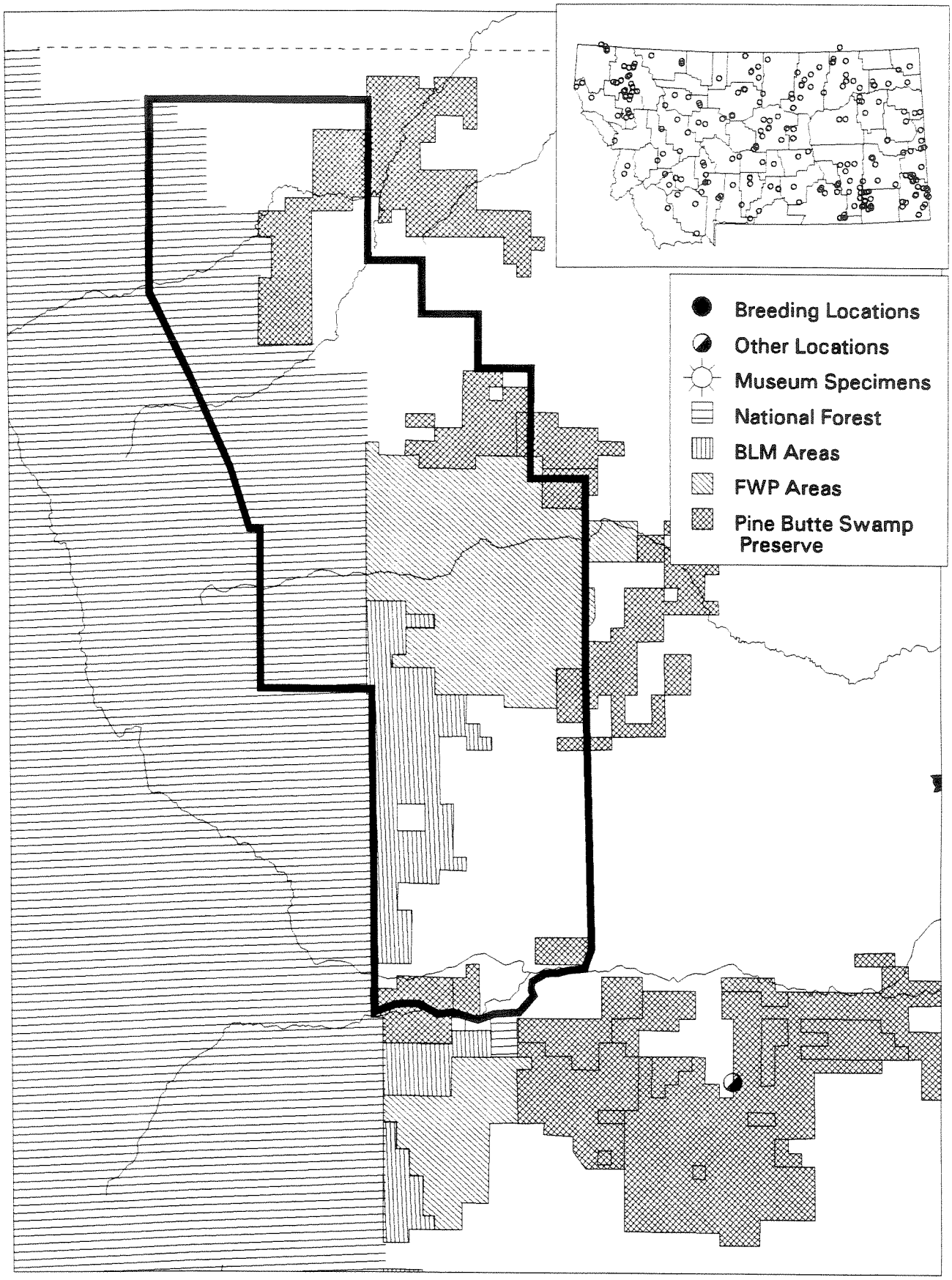
Habitat and Habits: Adults are found in grassland and sagebrush areas, particularly in areas with sandy or loose soil (Wheeler and Wheeler 1966, Hammerson 1982a, Baxter and Stone 1985). Except during breeding, they are seldom found in the water. They are primarily nocturnal and emerge from their burrows only following heavy rains. They breed in shallow temporary pools usually following heavy spring or summer rains (Hammerson 1982a). Males call loudly, with groups being heard for up to a mile. Eggs hatch after 2-3 days and tadpoles transform in 6-10 weeks (Wheeler and Wheeler 1966, Hammerson 1982a). During dry periods, adult spadefoots may remain inactive and underground for periods of up to several years in length.

Status: The Plains Spadefoot is not known from the study area; the nearest records are from Cascade County about 20-30 miles west of the Highwood Mountains, WNW of the Little Belt Mountains, and in Great Falls. Locally common in eastern Montana. There are large gaps in the known range probably due to the long time periods this species may spend underground, especially during droughts. It should be watched for at low elevations in prairie or shrub-steppe habitat on the study area; any located should be reported.

Montana Natural Heritage Program rank: G5 S4?

RANA PIPIENS -- NORTHERN LEOPARD FROG

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 AAABH01170

Northern Leopard Frog (*Rana pipiens*)

Description: Adults are brown or green with large, dark spots surrounded by light-colored halos on the sides and back. The dorso-lateral folds (ridges along the sides of the back) are usually lighter in color that the surrounding background. The under-side is typically white, but may be cream-colored or yellowish. The adult has a body length of 2-5". Newly transformed froglets may lack spots and are about 1" in length (Leonard *at al.* 1993).

Eggs and Tadpoles: Eggs are laid in 2-5" globular masses composed of hundreds to thousands of eggs (Hammerson 1982a, Nussbaum *at al.* 1983). The tadpoles are brown to dark brown on top with some metallic flecking, whereas the underside is often nearly transparent (Nussbaum *at al.* 1983). Total length of tadpoles may reach more than 3"; the eyes are located on top of the head.

Similar species: None, although some newly-transformed froglets may lack spots, which makes them extremely difficult to distinguish from Spotted and Wood Frogs.

Habitat and Habits: Northern Leopard Frogs are found in or near water in non-forested habitats. Vegetation is typically dense, as in a cattail marsh or dense sedge-meadow. Breeding takes place in lakes, ponds (temporary and permanent), springs, and occasionally backwaters or beaver ponds in streams. In Colorado, eggs hatch in 4-15 days and tadpoles take 8-15 weeks to metamorphose, depending on water temperature (Hammerson 1982a).

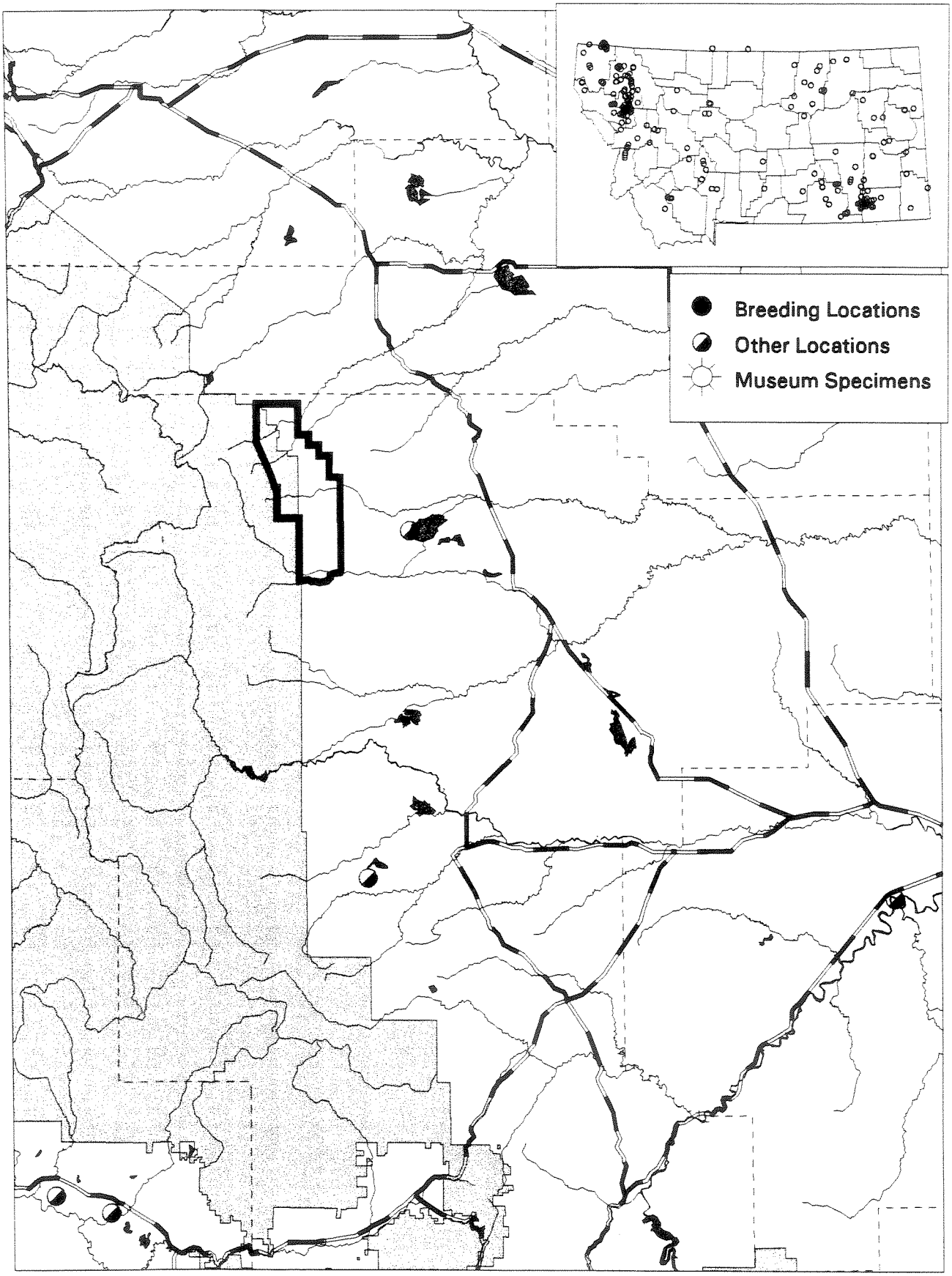
Status: Historically, the Northern Leopard Frog was widespread in Montana but it now appears to be extirpated throughout most of the western part of the state. Cope (1879) reported leopard frogs were abundant on the Plains and "on leaving the mountains this species immediately appears." It is still common and widespread in the southeastern corner of the state, but it is apparently declining in central and northeastern Montana. It appears that only very localized populations are still present on the western edge of the plains. Recent records in the vicinity of the study area include: 1) a single individual seen during a two-days period at Pine Butte Swamp in 1993; and 2) adults seen along the Dearborn River in 1993. Due to its significant decline and lack of current reports from the Rocky Mountain Front, all sightings of this species should be documented from the area.

Northern Leopard Frogs are now absent from many other areas in North America where they were common a few decades ago. Widespread extinctions are known from Alberta, Wyoming, Colorado, Idaho, Washington, and Oregon (Hammerson 1982b, Groves and Peterson 1992, Koonz 1993, Corn and Fogelman 1984, Leonard *at al.* 1993, Koch and Peterson 1995). Bullfrog and fish introductions, acid rain, ozone depletion, immune system suppression, and "Postmetamorphic Death Syndrome" have all been suggested as causes for frog and toad extirpations in other areas (Corn and Fogelman 1984, Hammerson 1982b, Carey 1993, Leonard *at al.* 1993).

Montana Natural Heritage Program rank: G4 S3S4. Species of Special Concern.

CHRYSEMYS PICTA -- PAINTED TURTLE

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARAAD01010

Painted Turtle (*Chrysemys picta*)

Description: Adult Painted Turtles have a relatively flat dorsal shell, or carapace, the length of which may reach 9" in females and 7" in males. The background color of the shell may be dark brown, olive, or black. A series of short, irregular yellow lines are often scattered across the shell, and a red and black border forms the outer edge. The ventral shell, or plastron, is red with a centrally-located yellow and black blotch with edges flaring out along the border of the scutes. The edge of the plastron also has a series of black and yellow blotches. The head, neck, and legs are marked with yellow lines and a red spot appears behind the eye. Very dark colored individuals are occasionally found. Males are distinguished by longer front claws and longer tails with the anus posterior to the margin of the carapace (Ernst *at al.* 1994).

Eggs and Young: The elliptical, white, soft-shelled eggs are about 28-35 mm in length and 16-23 mm in width (Ernst *at al.* et al.94). They typically number 6-23 per clutch. Coloration of young Painted Turtles is more vibrant and the shell is not quite as flattened as adults.

Similar Species: None.

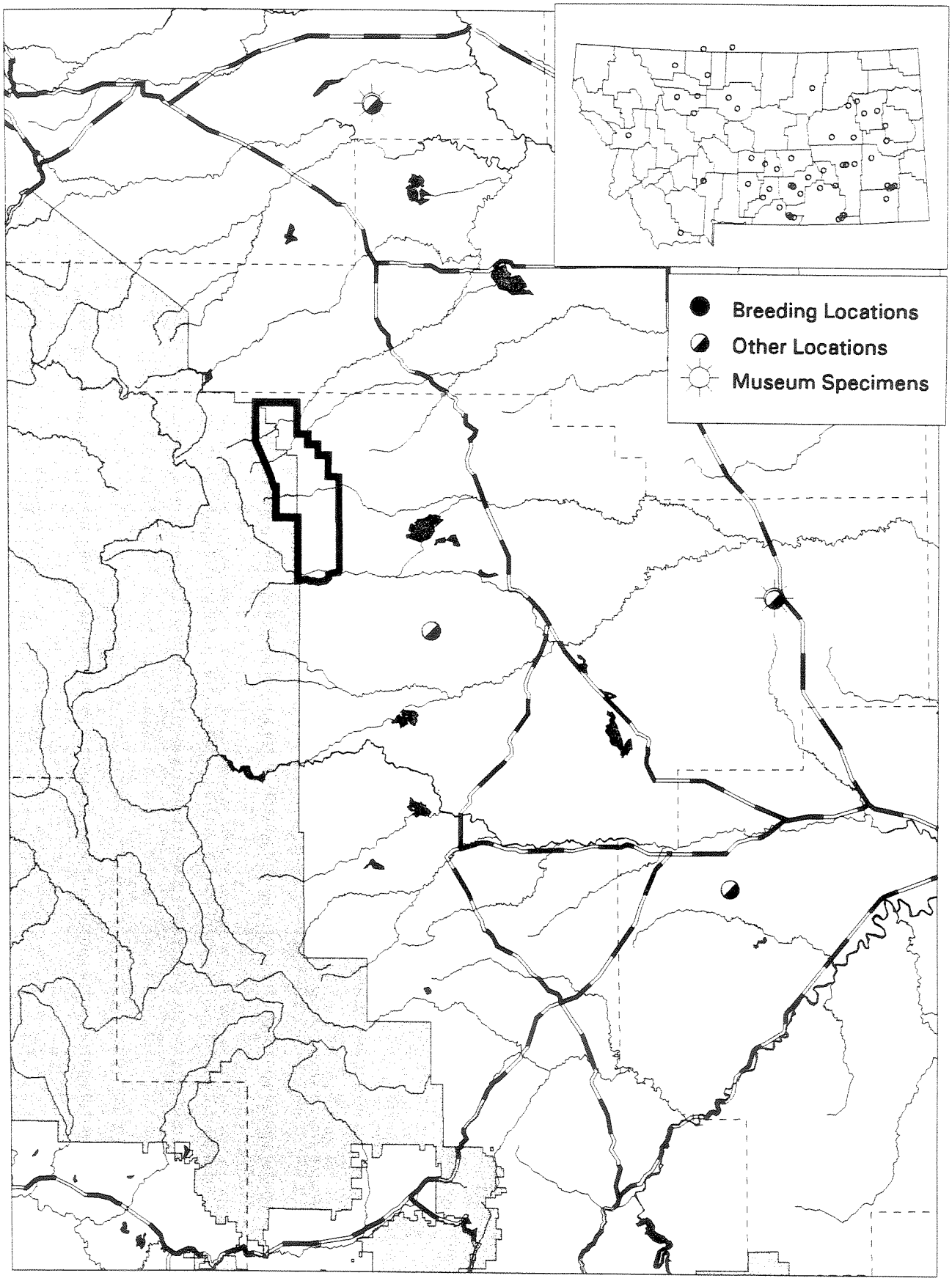
Habitat and Habits: Painted Turtles are active during the day and are rarely seen far from ponds, lakes, or the slow-moving water of streams. Adults are primarily herbivorous, feeding on a variety of aquatic plants, but will also scavenge on animal remains. Eggs are usually laid within 10-20 feet of the water's edge, although some individuals will travel up to 600 m seeking a suitable site. During egg-laying, the female excavates a hole with her hind feet and deposits the eggs, which are then covered by several inches of dirt. Predation on turtle eggs by raccoons and skunks is common, and shell fragments are evidence of such activity. Female Painted Turtles may lay more than one clutch of eggs each summer. Young borne of late egg depositions overwinter in the nest and do not emerge until the following spring (Ernst *et al.* 1994). Once females lay their eggs, they return to the pond, where they can often be seen basking on logs or rocks along with juveniles and males. Painted Turtles are sexually mature at 3-5 years of age and may live to be 30 years or older (Ernst *et al.* 1994).

Status: Painted Turtles were not found on the study area. A small lake on the Blackleaf WMA seemed the most suitable habitat on public lands, and only a few other ponds seemed even marginally suitable on the study area. Painted Turtles are locally common in Montana at lower elevations. They are known to occur only a few miles east of the study area. There has been some concern about Painted Turtle populations nationally, and whether declines have occurred in Montana is unknown. It should be watched for particularly at lower elevations in ponds in prairie or shrub-steppe habitat on the study area. Any animals located should be documented.

Montana Natural Heritage Program Rank: G5 S5

PHRYNOSOMA DOUGLASI -- SHORT-HORNED LIZARD

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARACF12030

Short-horned Lizard (*Phrynosoma douglasi*)

Description: The Short-horned Lizard has a broad, somewhat flatted body and relatively short limbs and tail. It is generally tan to gray with dark and light spots and blotches; the belly is white. There is a distinctive line of pointed scales along each side and the head has short, blunt "horns" pointing backward. Adult lizards range from 1.7 - 5.5" in length.

Young: Young are live-born and resemble small adults.

Similar species: None.

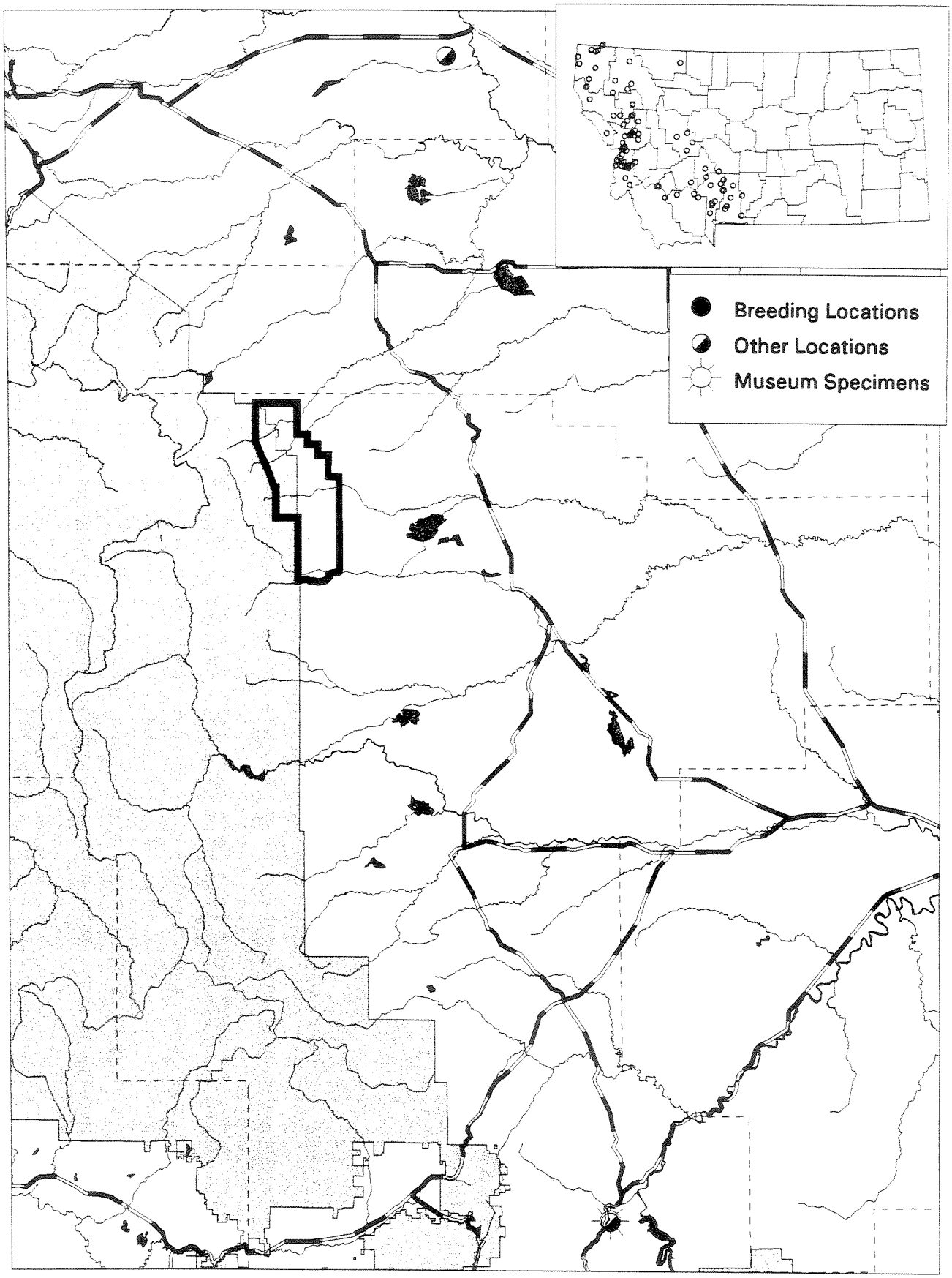
Habitat and Habits: The Short-horned Lizard is found in a variety of habitats, including dry open forests, grasslands, and sagebrush; the soil is usually loose or sandy. In firmer soil situations it may use the burrows of other animals. It is active during the day, typically with the peak of activity in mid-late morning. A Short-horned Lizard may squirt blood from its eyes when disturbed. Little is known about reproduction in this part of the range; young are born in late summer. Ants are the primary food of the species.

Status: Widely distributed (but apparently localized) in eastern Montana. This species may be vulnerable to collecting for the pet trade and agricultural conversion of native habitats. In the vicinity of the study area it has been found at Egg Mountain on Nature Conservancy land. It should be watched for in open pine, prairie, or shrub-steppe habitat with loose or sandy soils at lower elevations on the study area; any sightings should be documented. It apparently was originally much more common. Cope (1879) lists the most commonly encountered reptiles in order of abundance As: Western Rattlesnake, Short-horned Lizard, and Western Hognose Snake! He goes on to say that these species immediately appeared upon "leaving the mountains."

Montana Natural Heritage Program Rank: G5 S4.

CHARINA BOTTAE -- RUBBER BOA

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADA01010

Rubber Boa (*Charina bottae*)

Description: The Rubber Boa looks and feels like rubber, hence its name. It is a small snake (14-33" length), stout, and uniformly-colored either brown or green on the dorsal side. The ventral surface is cream to tan in color. The scales are small and smooth, except for those on the head which are enlarged. The tail is short and blunt and the eyes are very small. It is a very slow moving snake which can easily be caught if detected.

Young: Rubber Boas are born alive and young are more tan (or even pinkish) than the adults on both the dorsal and ventral surfaces.

Similar species: The Racer is much quicker and more active, has larger eyes, and a thin, tapered (not blunt) tail.

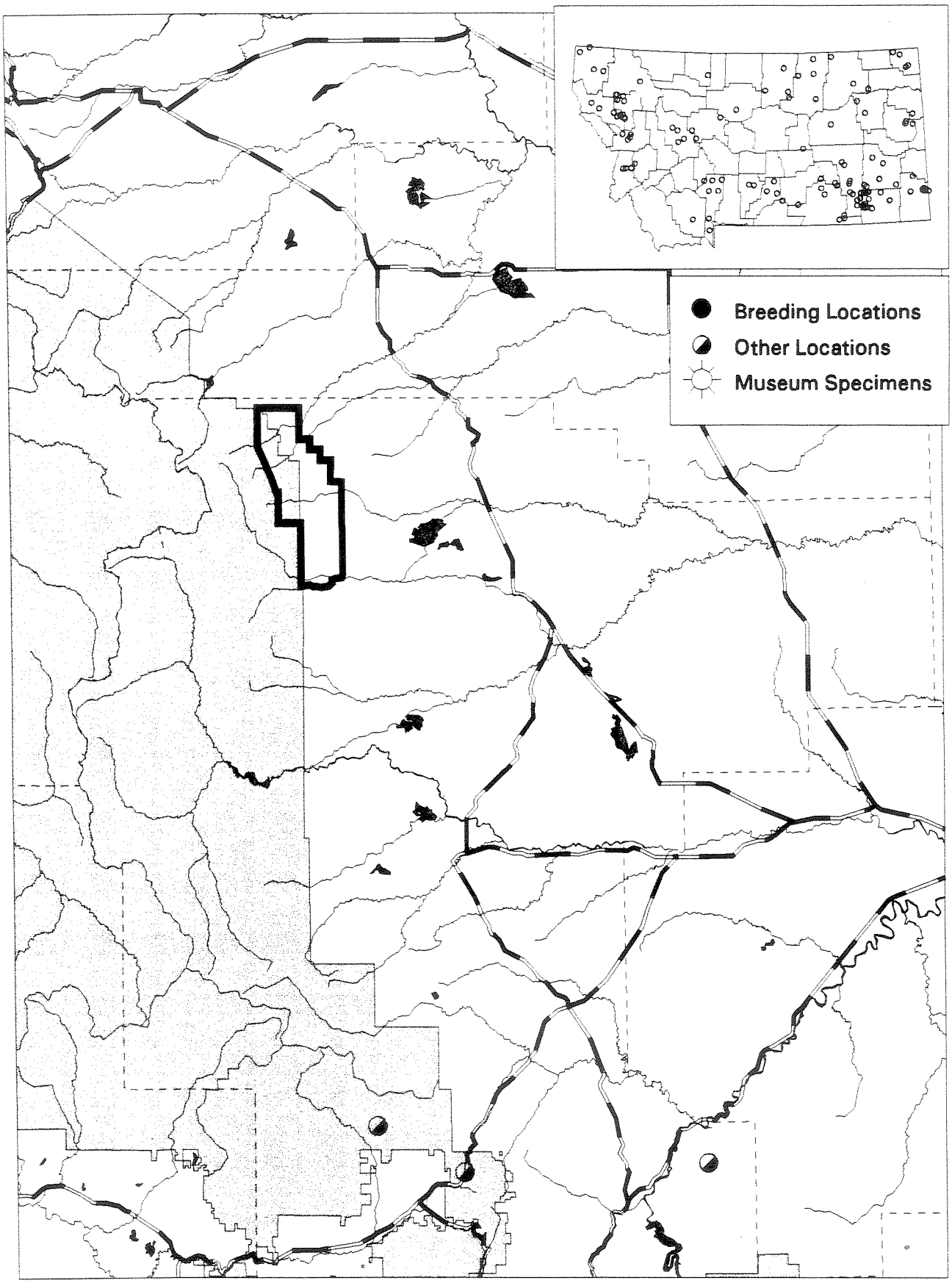
Habitat and Habits: The Rubber Boa is a secretive, slow-moving, docile snake, usually found under logs and rocks in either moist or dry forest habitats, but rarely in marsh or bog situations. Denning locations are typically in areas with fractured rock; recent radio-telemetry data indicates it only moves short distances (< 2 km) from its den (Peterson pers. comm). It is most commonly found in canyons with a well developed riparian area in the bottom and fractured rock on sunny, south-facing slopes above. Occasionally this snake is seen sunning itself on a road, trail, or open area, but it is primarily nocturnal. Feeding is primarily on small mice, but also on shrews, salamanders, snakes and lizards. Two to eight young are born alive in late summer or early fall.

Status: Sightings of Rubber Boas are infrequent, but they are widely distributed and probably common throughout western Montana. They were not found during this survey, nor are there historic records of their presence in the vicinity of the study area. However, they probably do occur throughout the Rocky Mountain Front at low to mid-elevations. They should be watched for on the study area; any sightings should be documented. Of particular interest would be any documentation of any denning sites located.

Montana Natural Heritage Program Rank: G5 S4.

COLUBER CONSTRICTOR -- RACER

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADB07010

Racer (*Coluber constrictor*)

Description: A slender, but moderately long snake, the Racer ranges from 20-65 inches in length. Adult coloration is uniform across the dorsal side but it can vary from a greenish-gray to brown or blue. The ventral side is whitish to pale yellow, the latter color extending onto the upper lip scales and nasal region. The eyes are relatively large. The scales are smooth and the nostril is bordered by two scales.

Young: Snakes up to about 20" have a much different coloration than the adults, consisting of a series of dorsal brown blotches edged with black which run the length of the animal; a row of blotches is also found on each side of the animal extending onto the ventral side.

Similar species: Young Gopher Snakes may be distinguished by the keeled rather than smooth scales of the young Racer. Young Western Hognose Snakes have an upturned nose. Smooth Green Snakes are smaller and colored bright grass-green and whitish below; their nostrils are centered in single scales. Also see Rubber Boa.

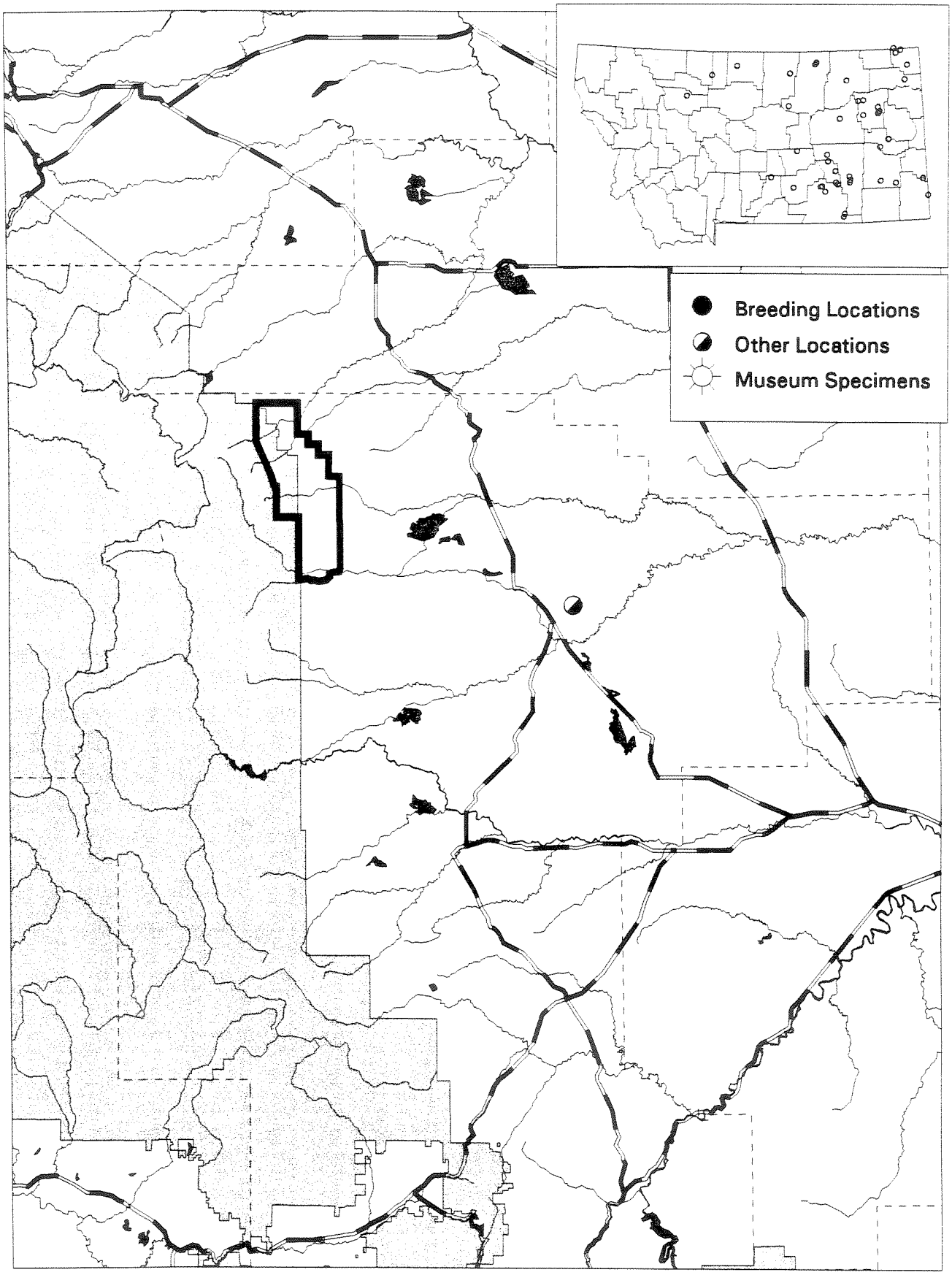
Habitat and Habits: The Racer is associated with more open habitats either in shortgrass, shrub-steppe, or forested areas (Hammerson 1982a, Baxter and Stone 1985). It is often found near water and rocks. The Racer is an extremely fast and agile snake. A clutch of perhaps 3-7 eggs is laid in the summer (Stebbins 1985). It preys on insects and small vertebrates such as mice and frogs.

Status: The Racer was not seen in this survey nor are there historic records from the study area or Teton County. However they are known just to the south of the RMRD and from about 25 miles west of the Little Belt Mountains. They possibly do occur on or near the study area at low to mid-elevations; any sightings should be documented. Of particular interest would be documentation of any denning sites located.

Montana Natural Heritage Program Rank: G5 S5.

HETERODON NASICUS -- WESTERN HOGNOSE SNAKE

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADB17010

Western Hognose Snake (*Heterodon nasicus*)

Description: The Western Hognose Snake is a mid-sized, heavy-bodied snake reaching 32". The dorsal ground color is yellowish- to grayish-brown, with 3 rows of darker brown to black blotches run down the back. The belly is dark gray to black, sometimes checkered. Its nose has a keel on the top and is upturned.

Eggs and Young: Eggs are white and elliptical, with thin, papery shells; length averages 32.5 mm (26-38 mm) and width 18 mm (14-23 mm). Young are 139-197 mm at hatching and are similar in color and pattern to adults (Platt 1969).

Similar Species: No other Montana snake has a keeled nose. Coloration is similar to both the Gopher Snake, Western Rattlesnake and juvenile Racer.

Habits and Habitat: The Western Hognose Snake is found on the plains of eastern Montana. It seems to prefer arid areas, farmlands and flood plains, and particularly areas of gravelly or sandy, loose soil. The keeled, or shovel-like, nose is thought to help it to dig down to its food, which it finds by smell. Apparently toads are its preferred food, though frogs, insects, and other small animals are also eaten (Platt 1969). It is active primarily during the daylight hours. Little is known of reproduction in Montana. In Kansas, Western Hognose Snakes typically lay clutches of 7-15 eggs (Platt 1969). It is likely that a female will only breed every other year in Montana.

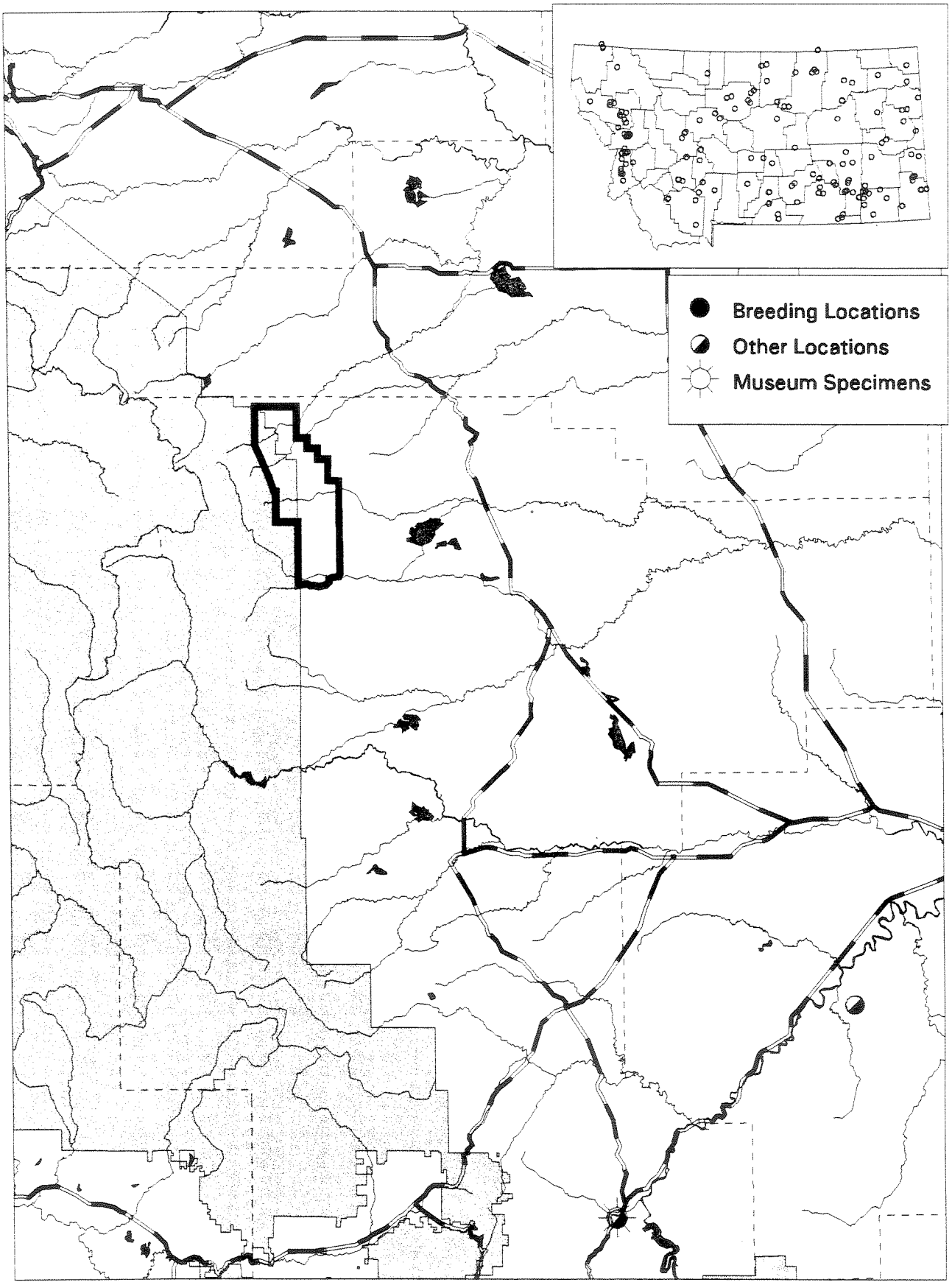
The Hognose is famous for its behavior in the face of a threat. At first it will puff up its neck, as does a cobra, and hiss and strike at its enemy. However, this is all a bluff and very rarely will it actually bite. If this threatening strategy does not work, it will pretend to die. It appears to go into convulsions, writhing on the ground, sticking its mouth in the dirt, and eventually rolling on its back and going into a trance that makes it appear to be dead. If turned right-side-up, it will roll back over and continue its deception. If left alone for a few minutes, it will right itself and continue on its way. The initial aggressive display and basic rattlesnake-like coloration cause many to be killed needlessly by people who mistakenly believe it to be venomous.

Status: They were not found during this survey, nor are there historic records of their presence in the study area. However, they may occur on the study area at low to mid-elevations, particularly in sandy or loose soil areas. The nearest location to the study area is from central Teton County about 30 miles east. They should be watched for on the study area; any sightings should be documented. We have relatively few reports of the Western Hognose Snake from Montana. It is collected for the pet trade, and populations may be vulnerable to commercial collectors. Additionally, since toads are its preferred food, any decline in toad populations would be expected to negatively impact Western Hognose Snakes. It apparently was originally much more common. Cope (1879) lists the most commonly encountered reptiles in order of abundance as: rattlesnake, horned lizard, and hognose snake! He goes on to say that these species immediately appeared upon "leaving the mountains." Of particular interest would be documentation of any denning sites located.

Montana Natural Heritage Program Rank: G5 S3? Species of Special Concern.

PITUOPHIS CATENIFER -- GOPHER SNAKE OR BULLSNAKE

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADB26020

Gopher Snake (*Pituophis catenifer [=melanoleucus]*)

Description: Montana's largest snake, the adult Gopher Snake (also called Bullsnake or Pine Snake) can reach a total length of 7 feet, but most individuals seen in Montana range between 3-5 feet. It is readily recognized by a series of large black to brown blotches which run down the back, and another series along the sides. The blotches, which are set on a yellow background, become more widely spaced and darker towards the tail. The dorsal scales are keeled. There is usually a black band on the head located in front of and extending below the eyes. The ventral coloration is yellow to white, often spotted with black, and the anal plate is undivided.

Eggs and Young: Gopher Snakes lay between 2-24 eggs during the summer months (Hammerson 1982a), and the young resemble the adults in coloration.

Similar species: Young Racers have a black border on dark blotches and the scales are not keeled. Young Western Hognose Snakes have an upturned nose. Western Rattlesnakes have a rattle on their tail and triangular shaped heads.

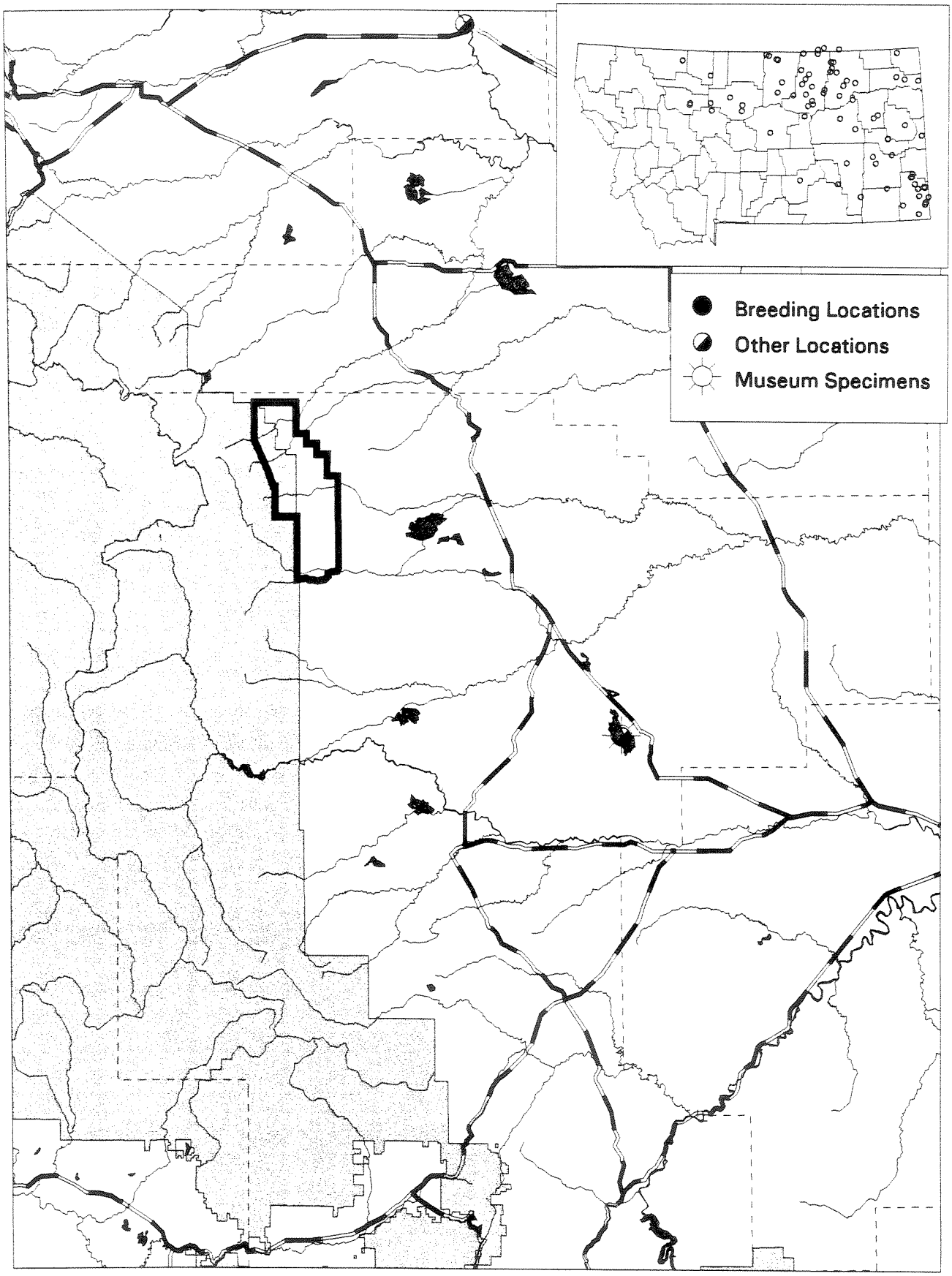
Habitat and Habits: Gopher Snakes are associated with dry, arid habitats including grassland, shrub-steppe, and open pine forest. They feed on rodents, rabbits and ground dwelling birds, and to a lesser extent on frogs, toads, etc., found around stock ponds and other wetlands. They have a habit of hissing and vibrating the tail when alarmed, often sounding somewhat like rattlesnakes. They occasionally climb trees, hence the common name "Pine Snake."

Status: The Gopher Snake was not seen in this survey nor are there historic records from the study area or Teton County. However, they are known from lower elevation areas on the plains to the east. They may occur on the study area at low to mid-elevations, but the occupied range may actually end farther east; any record in the area should be reported, and would be a new county record, helping to define the east edge of the range. Of particular interest would be documentation of any denning sites located.

Montana Natural Heritage Program Rank: G5 S5.

THAMNOPHIS RADIX -- PLAINS GARTER SNAKE

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADB36100

Plains Garter Snake (*Thamnophis radix*)

Description: The Plains Garter Snake ranges in size from 16-42" in length and has a dorsal background color of olive, brown, or black. It has a prominent orange or yellow dorsal stripe and a greenish-yellow stripe on each side located on the 3rd and 4th scale rows above the belly scales. It typically has black vertical bars on the upper lips.

Young: Young resemble adults.

Similar species: The other garter snakes found in Montana have the lateral yellow lines on the 2nd and 3rd scale rows above the belly scales. All the Plains Garter Snakes I have seen or heard about from Montana, have orange dorsal stripes.

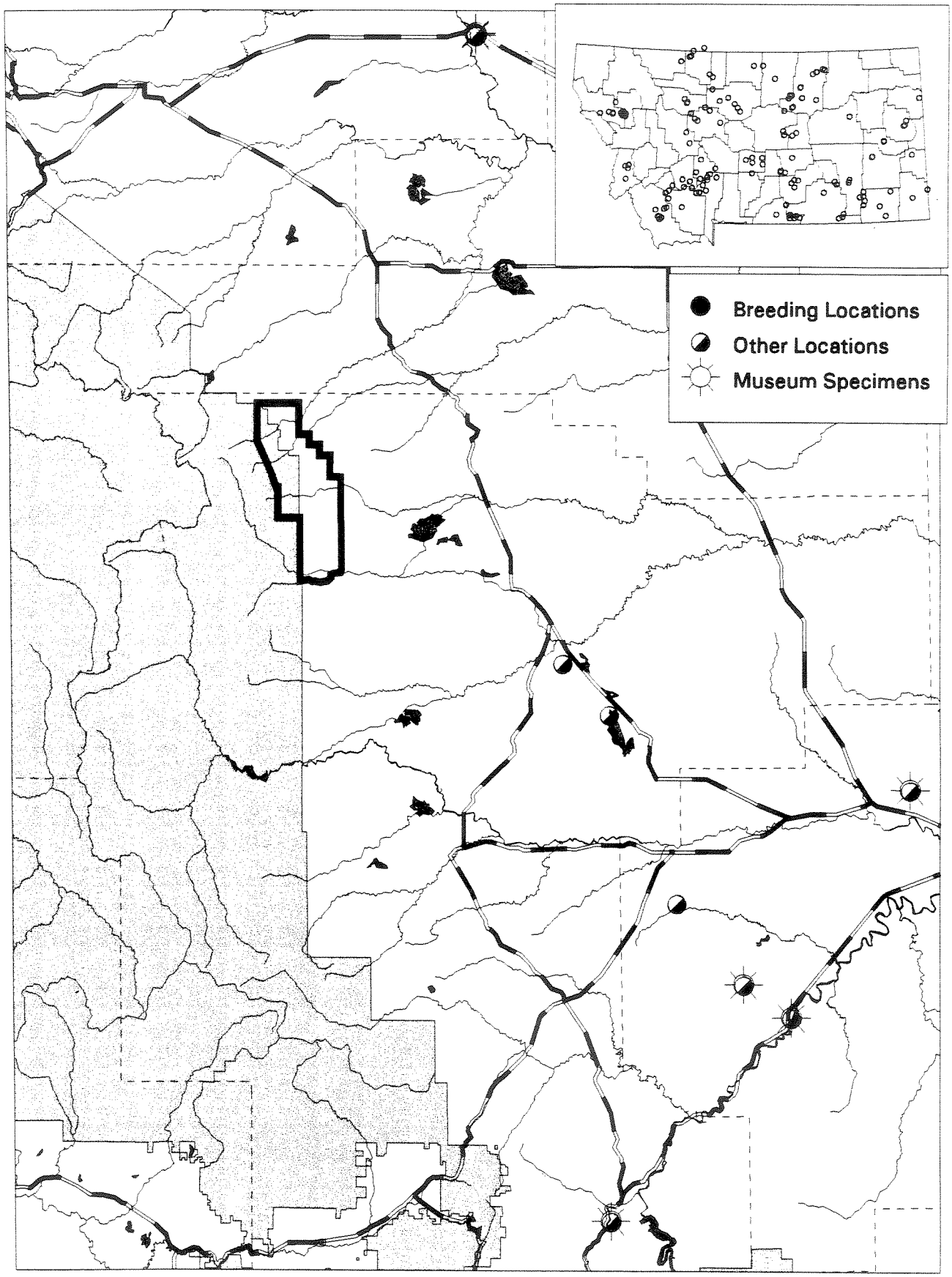
Habitat and Habits: The habitat and habits of the Plains Garter Snake are similar to those of the Common Garter Snake.

Status: Found over much of eastern Montana. Its status is unclear due to confusion in the identification of the 3 garter snakes which occur there, but appears to be moderately common in the eastern 1/3 of Montana. In the vicinity of the study area it has been found near Freezeout Lake, the second westernmost record for this species in the U.S. [a sight record along the Cut Bank River in Glacier County is the westernmost]. It should be watched for in prairie or shrub-steppe areas near water at lower elevation of the study area and any sightings should be well documented with a description written at the time of observation including how *radix* was distinguished from the other garter snakes. Of particular interest would be documentation of any denning sites located.

Montana Natural Heritage Program Rank: G5 S4.

CROTALUS VIRIDIS -- WESTERN RATTLESNAKE

Occurrences on the northern Rocky Mountain Front, Montana



Species locations from the Montana Natural Heritage Program, June 18, 1997 ARADE02120

Western Rattlesnake (*Crotalus viridis*)

Description: Rattlesnakes have a heat-sensing pit located between the nostril and the eye. The fangs are hollow and hinged, allowing them to be folded back against the roof of the mouth. The head is triangular in shape and blunt-nosed. The eyes are slightly elevated. There are several white lines which run along the side of the head. Adult Western Rattlesnakes have a narrow neck but a stout body with total length ranging from 15-60 inches. The dorsal background color varies from pale green to brown with a series of brown or black blotches edged with a dark and then light line extending the length of the body. The blotches often merge into rings on the tail. There are also blotches on the sides of the body. The ventral side is pale yellow to white and without blotches. The scales are keeled. The tail ends in a rattle which helps to warn potential predators of the snake's presence. The young have the same color pattern, but are brighter in color than adults.

Similar species: No other snake in Montana has rattles, but see Racer, Gopher Snake and Western Hognose Snake which may have similar color patterns.

Habitat and Habits: The Western Rattlesnake is an inhabitant of more open and arid country but it is also found in Ponderosa pine stands or mixed grass-coniferous forests. It is more likely to be encountered on south-facing slopes and areas of rock outcrops. It is feared and often needlessly killed due to its poisonous bite. Rattlesnakes may den in large numbers, moving up to 7 miles out from the dens during the summer (Peterson, pers. comm.); den sites are most common in south-facing talus slopes. In Wyoming, it is found at elevations of over 8500 feet (Baxter and Stone 1985). Rattlesnakes prey on a variety of animals including mice, ground squirrels, rabbits, amphibians, and other snakes. Females give birth to 4-21 young in Colorado during the summer (Hammerson 1982a).

Status: The Western Rattlesnake was not been found on the study area. The closest locations known are Rattlesnake and Priest Buttes, just west of Freezeout Lake (Kristi DuBois, pers. comm.). It is also known from lower elevation areas to the north, south, and east. It would most likely be encountered at lower elevations in open habitats. The habit of denning at traditional sites in large numbers makes rattlesnakes vulnerable to commercial collecting or simply killing by fearful people. Observations of Western Rattlesnakes should be reported to document the presence of this species on the study area; of particular interest would be documentation of any denning sites located.

Montana Natural Heritage Program Rank: G5 S4.

Northern Bog Lemming

I searched for suitable habitat for northern bog lemmings while traveling to and conducting reptile and amphibian surveys across the study area (Appendix 3). The only site within the study area with even marginally suitable habitat was Blackleaf Swamp. Northern bog lemmings were not captured there, nor at nearby Pine Butte Swamp (Table 1). At each site however, 4-5 species of other small mammals were captured (Table 2). These included masked shrews (*Sorex cinereus*), montane shrews (*Sorex monticolus*), water shrews (*Sorex palustris*), meadow voles (*Microtus pennsylvanicus*), and deer mice (*Peromyscus maniculatus*). Some shrews and microtines will need the preliminary field identification verified when the skulls are cleaned.

The northern bog lemming habitat on the study area is very limited; the only suitable site seen was trapped. Trapping intensity was probably sufficient to detect lemmings had they been present; more surveys are not warranted at this time. Additionally, many meadow voles were captured at Blackleaf and bog lemmings have not been found at sites with high numbers of meadow voles also present at any Montana location (Reichel and Beckstrom 1993, 1994). It seems unlikely that bog lemmings were actually present at this site, but went undetected. Trapping effort was 227 trap-nights over 2 nights. Previous snap-trap effort required to document bog lemming presence (at sites found to contain the species) averaged 114 trap-nights, and ranged from 46 trap-nights (during 1 night) to 224 trap-nights (during 3 nights of trapping) (Reichel and Beckstrom 1993, 1994). At Pine Butte Swamp, however, the habitat suitable for bog lemmings appeared to be of higher quality and to be more widespread than at Blackleaf. Given the lack of meadow voles and the large amount of habitat not trapped, it would be worth doing additional bog lemming surveys at Pine Butte Swamp. If bog lemmings were located at Pine Butte Swamp, then re-trapping Blackleaf Swamp should be considered.

While northern bog lemmings were not found on the study area, it is near the edge of their range in Montana which includes from the northwest corner of the state east to the Rocky Mountain Front, and south through the mountains to Lost Trail Pass on the Continental Divide. The Woods Creek site is only 50 km south of the study area and the habitat is seemingly both lower quality and smaller than either Blackleaf or Pine Butte swamps. The Maybee Meadows and the Wood Creek sites are the only known northern bog lemming sites east of the Continental Divide in Montana. The Maybee Meadows site is the southern-most site known for the species outside of New England; two sites in New Hampshire are about 160 km farther south (Clough and Albright 1987; Reichel and Beckstrom 1993, 1994). We expect additional populations to be found across western Montana, perhaps as far south as Yellowstone National Park, and possibly east to mountain ranges such as the Little Belt Mountains. The known elevation range for Montana is from 3340 ft (McDonald Creek, Pearson 1991) up to 6520 ft (Maybee Meadows, Reichel and Beckstrom 1993).

Table 1. Sites trapped during 1996 northern bog lemming surveys on or near the Rocky Mountain Front study area.

Site	Location	Elevation	Date	Trap-nights
Blackleaf Swamp, Teton Co.	T26N R08W S29 SW¼ & S28 NW¼	4900	10-12 Sept	227
Pine Butte Swamp, Teton Co.	T24N R08W S13 NE¼ & S12 SE¼	4600	10-12 Sept	230

Table 2. Results of snap trapping during 1996 northern bog lemming surveys.

Site	Trap Nights	Total number of each species caught					
		SOPA	SOMO	SOCI	SOSP	MIPE	PEMA
Blackleaf Swamp, Teton Co.	227	1	7	4	10	27	1
Pine Butte Swamp	230		2	2	6	3	1
Grand Total	**457**	**1**	**9**	**6**	**16**	**30**	**2**

SOPA=*Sorex palustris*; SOMO=*Sorex monticolus*; SOCI=*Sorex cinereus*; SOSP=*Sorex* spp.; MIPE=*Microtus pennsylvanicus*; PEMA=*Peromyscus maniculatus*.

During 1992-1993 lemmings were found at 10 of 17 sites that appeared to have suitable lemming habitat. Either the lemmings were at all those sites and we failed to detect them, or we sampled some sites with apparently good habitat, which actually lacked lemmings. Probably a combination of the two is actually the case (Reichel and Beckstrom 1993, 1994). The percentage of sites with good habitat which had lemming captures was slightly higher than that of Pearson (1991) who found lemmings at 3 of 11 bog/fen sites trapped with Sherman live traps in 1989-90. Bog lemmings have been found in at least nine community types (Table 4), including some of those present at the sites trapped in 1996. However, peatland communities constitute a very small proportion of the landscape in Montana and have not been adequately classified (Bursik and Moseley 1992). Whether new information on these fens will result in newly defined community types which closely approximate habitat used by northern bog lemmings remains to be seen. Extensive thick moss mats were present in all but one of the lemming sites found during our previous surveys (Reichel and Beckstrom 1993, 1994), and were also present at Numa Ridge Bog, McGee Meadows (Pearson 1991, P. Lesica pers. comm.) and Shoofly Meadows (Pearson 1991, S. Chadde pers. comm.).

In 1993 I spent several hours along Camas Creek in the vicinity of the first lemming population known from the state (Wright 1950) and found only scattered clumps of moss. Weckwerth and Hawley (1962) did not adequately describe the two specific sites where they captured bog lemmings, but they were visited by D. E. Pearson (pers. comm.) who found they were not located in fens or covered by thick moss mats. At these three sites trapping was conducted in multiple years, often twice each year (Camas Creek: 18 yrs [Hoffmann *et al.* 1969]; Anaconda #1: 6 yrs spring and fall [Jonkel 1959]; Anaconda #6: 4 yrs spring and fall [Jonkel 1959]). Despite this intensive trapping, only a total of 3 individuals have been taken in Camas Creek in 2 of 18 years, and 1 individual at each of the two Anaconda Creek sites. A similar situation exists with the McDonald Creek site which is in old-growth western hemlock (*Tsuga heterophylla*) forest (Pearson 1991); this site has been trapped multiple times yielding only a single lemming (June 1991 - September 1993, total 3600 trap-nights, D. E. Pearson, pers. comm.). Apparent high quality habitat patches exist within 7 km of all four sites (Table 9, 10; Pearson 1991; P. Lesica, pers. comm.). It seems likely that these sites are very marginal, and/or that the individuals were found while dispersing from a nearby high quality site.

Other habitat descriptions of *S. b. chapmani* trapping sites in the northern Rocky Mountains have sometimes included mention of sphagnum moss (Layser and Burke 1973, Groves and Yensen 1989) while others have not (Wilson *et al.* 1980). I captured a single juvenile male lemming on a dry alpine/subalpine ridge in northeast Washington (Wilson *et al.* 1980).

Areas with extensive moss mats, particularly sphagnum, are the most likely sites in which to find new bog lemming populations in Montana. Other habitats in Montana may either support lower densities of bog lemmings; be used primarily by dispersing individuals; be used during specific seasonal, climatic, or competitive situations; or be population sinks. Marginal habitats and areas may be important to maintain population viability. The only certainty is that there is much to be learned about habitat use by northern bog lemmings.

Table 4. Plant communities present at 6 northern bog lemming sites.

Community\\phase	Sunday Creek	Cody Lakes	Bowen Creek	Wood Creek	Maybee Meadows	Meadow Creek
Abies lasiocarpa \\Calamagrotis canadensis	yes					
Picea \\Salix geyeriana- Carex utriculata				yes		
Salix drummondiana	yes					
Salix planifolia- Salix wolfii \\Carex aquatilis					yes	
Betula glandulosa \\Carex utriculata					yes	
Betula glandulosa- Eleocharis pauciflora \\Carex lasiocarpa		yes				
Betula glandulosa- Carex lasiocarpa			yes			
Carex utriculata (=C. rostrata)					yes	yes
Eleocharis pauciflora		yes				

Patch size of known bog lemming sites in Montana varies from 1-340 acres, with 7 of 13 being less than 10 acres (Table 5). No patch sizes are known for 4 sites since they are not in typical habitat (see preceding paragraph). Most sites found thus far in Montana appear to be patches within potentially larger metapopulation patch complexes. These could include: a Sunday Creek complex with a Bowen Creek complex; a Maybee Meadows complex possibly with the Meadow Creek patch; and a McGee Meadows complex which may be part of a larger complex in Glacier National Park. However, several small patches appear to be isolated. Numa Ridge Bog (3 ac) is 5 km from the nearest fen/bog patch (Pearson 1991). Shoofly Meadows is larger (24 ac) but may be 14 km from another suitable patch. Wood Creek is certainly at the extreme, having only about 2 ac of moss mat habitat and being 13 km from the nearest known potential site. While there appears to be substantial amounts of marginal habitat along Wood Creek which might support bog lemmings, much of the riparian habitat has been heavily impacted by domestic livestock grazing.

This leads to questions about what constitutes a viable population of northern bog lemmings. Three (somewhat) alternative hypotheses could apply: 1) lemmings live in habitat patches which have been isolated for thousands of years; 2) lemmings move substantial distances between patches supplementing (or recolonizing) the sub-population within a patch and contributing genetic material; and 3) lemmings use habitats other than moss bogs/fens.

Alternative 1. Populations within patches such as Wood Lake and Numa Ridge Bog would not appear to have been able to survive given the small habitat patch size, if they are indeed totally isolated and if lemmings do not use habitats other than moss mats. This leads us to think that this alternative is not completely feasible.

Alternative 2. In several areas such as the Sunday Creek complex, the distribution and size of known patches suggests movement between patches. The overall view that most patches in Montana are relatively near other known, or potential, patches, gives support to this hypothesis. Arctic lemmings are known to make spectacular movements during highs in the population cycle; this could also be true of northern bog lemmings. Northern bog lemmings do undergo populations fluctuations at least in central Canada (Edwards 1963). However, population cycles in general appear to be less dramatic in: 1) more southerly areas, and 2) in areas with less contiguous habitat for the cycling species.

Alternative 3. Lemmings have certainly been found in habitats other than bogs/fens in Montana and in other areas of their range. In the Montana sites where the habitat is atypical, captures represent a rare event. Multiple trapping periods prior to and/or following the capture have not resulted in regular additional captures of lemmings. In Glacier National Park, general trapping for small mammals over nearly 100 years in numerous habitats has resulted in captures of 5 lemmings at 4 sites (all atypical habitats) (Wright 1950, Hoffmann *et al.* 1969, Weckwerth and Hawley 1962, Pearson 1991). In the rest of Montana, only 1 site has been found during general small mammal trapping (Shoofly Meadows, a typical habitat site) (Adelman 1979). However, when trapping focused on bog/fen habitat, 12 new sites were discovered in the past 4 years (Pearson 1991, Reichel and Beckstrom 1993, 1994). Many of these sites have had multiple animals captured in a single night, supporting the premise that the fen\bog habitat is the primary habitat for northern bog lemmings in Montana. The extent of lemming use of other habitats has yet to be determined, but would appear to be low.

Probably all three alternatives have some element of reality. It seems likely that 1) some patch complexes are isolated from others and have been for long periods of time; 2) some relatively long distance movements may increase gene flow, supplement small populations, and allow for recolonization of extirpated patches; and 3) while bog lemmings use a variety of habitats to a limited (and largely unknown) extent, bog and fen habitats hold the densest populations of lemmings.

RECOMMENDATIONS

1) All incidental sightings of amphibians and reptiles from the Study area should be recorded and forwarded to the Natural Heritage Program. The single exception being that for the Western Chorus Frog need not be recorded. Certainly all Tailed Frogs (larvae and adults) found during fisheries surveys should be recorded; this is the most efficient way to get data on this species. Particular attention needs to be given to any Western Toad and Northern Leopard Frog breeding sites found.

2) Sightings on the study area of the Long-toed Salamander, Plains Spadefoot, Painted Turtle, Short-horned Lizard, Rubber Boa, Racer, Western Hognose Snake, Gopher Snake, Plains Garter Snake, and Western Rattlesnake would represent first-time occurrences and range extensions, thus it is important to document and record such data. Preferably either photos should be taken or, if appropriate, a specimen collected; at the very least, a description should be written at the time of the observation.

3) No additional northern bog lemming surveys are recommended for the study site, unless northern bog lemmings are found at a locations less than 20 km from the study area. In that case, another survey of Blackleaf swamp would be justified.

4) With an increasing number of amphibians species declining for various reasons, it seems reasonable to pro-actively manage habitat to support them. While not all ways of preserving these species are currently known, several management actions could certainly negatively impact them. Without adequate breeding areas, amphibians cannot survive, and the types of water used is often species-specific.

a) Fish stocking in currently fishless lakes and ponds in which amphibians breed should be carefully evaluated. Fish introductions are thought to be a major factor in frog declines in the Sierra Nevada Mountains and probably elsewhere as well (Hayes and Jennings 1986).
b) When "improving" springs or seeps for livestock, leave a portion of the area suitable for amphibian reproduction. This could include a small fenced off area above where the water is taken up and put into a watering tank.
c) Springs, seeps, and both permanent and temporary ponds should be considered when analyzing effects of land management activities such as grazing, logging, and road building.

5) A critical component of the life cycle in snakes is the wintering den. Many species hibernate

in large aggregations in traditionally-used sites. Often these hibernacula are used by several species, and mating takes place at the den site. Snakes then move out for up to 10 km for the summer, returning in the fall. These sites are typically on south-facing slopes in areas where snakes can get well down into an area of fractured rock, often near cliffs or in talus. While these sites are robust, road building or mining may nonetheless destroy them. Den sites should be protected and data relating to their locations kept where successive biologists have access to them.

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APPENDIX 1.

DATA SHEETS USED FOR

SURVEYS AND OBSERVATIONS

Data Sheet - Small Mammal Snap Trapping ___ of ___

Date_____ Time_____ Biologist_____

Gen. Location_____
T_____N R_____W Section_____

Weather_____
(Temp., wind dir & speed, cloud cover, precip last 24 hrs)

List all individuals caught under the type of bait used

Bait_____ # Traps_____ # Snapped_____

Bait_____ # Traps_____ # Snapped_____

AMPHIBIAN SURVEY DATA SHEET: INSTRUCTIONS This data sheet is designed to facilitate quick recording of data from field surveys of amphibians and their habitats. It appears complex and intimidating, but actually can be completed in a short amount of time after a minimum amount of training. Many variables require only the correct choice to be circled, and the remaining variables are numerical and easy to determine. The data sheet is divided into four sections, divided by double lines. Each section describes a cohesive set of variables. In addition the back of the sheet includes a grid for a rough sketch of the site and space for additional comments. The map is optional, but the future value of the data is enhanced if it is supplied.

SECTION 1 – LOCALITY *These data are essential. Many amphibian surveys have been hampered by the inability to relocate exact locations in the historical record. Some of this information can be completed in the office after the survey.*

DATE: Use the format DD-MMM-YY (e.g., 05-APR-92).

BEGIN TIME: List the time survey of habitat for amphibians began in 24 hour format.

END TIME: List the time the survey ended in 24 hour format. (The total time (END TIME - BEGIN TIME) should reflect only the amount of time spent searching for amphibians. Total time plus number of observers may be used to assess relative abundance.)

OBSERVERS: List names or initials of all persons involved in searching.

LOCALITY: Describe the *specific* geographic location of the site. Use air distance in two directions (e.g., 5km N and 7.5 km W) of a map landmark that likely will not change (distance from a large town or city is not all that helpful).

STATE: Use the 2-letter abbreviation.

COUNTY:

MAP NAME: List the name of the U.S.G.S. quadrangle or other map used to locate the site.

OWNER: List the public land manager (e.g., Roosevelt Nat. Forest or Rocky Mtn NP), or name of the owner if the site is on private land (listing the owner's name will make it clear that you did not trespass to survey the site).

ELEVATION: Circle the scale used; meters are preferred.

T: township R: range S: section

SECTION DESCRIPTION: Describe the location of the site within the section (e.g., SE ¼ or NE ¼ of SE ¼)

UTM ZONE, NORTHING, EASTING: Universal Transverse Mercator coordinates are preferred over longitude and latitude. The UTM zone is listed on newer topographic maps. If you are using a map without the UTM grid, substitute latitude for Northing and longitude for Easting.

SECTION 2 – SPECIES DATA *List all amphibian species observed. If garter snakes are seen, list them here also.*

SPECIES: Use the scientific name. Convenient shorthand is to use a 4-letter code made up of the first 2 letters of the genus and species (e.g., *Rana sylvatica* would be RASY).

ADULTS/JUVENILES: Indicate presence with a check, but numbers seen are more valuable data

CALLING?: Circle Y if frogs are vocalizing in a breeding chorus, of if a breeding aggregation of species that don't call (e.g., *Bufo boreas*) is observed.

TADPOLES/LARVAE: Same as for adults/juveniles

EGG MASSES: Same as above. Numbers of egg masses are especially valuable data. If possible, describe the developmental stage of eggs in the space for additional notes on the back of the form.

METHOD: Circle how observations were made: VISUAL/AURAL ID – species identified without picking it up, either by sight or by recognition of the breeding call; HAND COLLECTED – animal was picked up and identified in the field (higher confidence than visual id); DIP NET/SEINE – the usual method of collection for larvae; TRAPPED – minnow-type traps are also used for larvae; VOUCHER COLLECTED? – circle yes or no (voucher specimens are recommended for every site, *especially if identification is uncertain and for larvae*). Indicate voucher status in addition to method used.

FISH PRESENT?: If yes, list species if you can. Circle the question marks if you are not certain, but suspect that fish are present.

ENTIRE SITE SEARCHED?: If no, list either the meters of shoreline or the area (m^2) of habitat (e.g., amount of wet meadow) searched.

SECTION 3 – PHYSICAL AND CHEMICAL DATA *Water chemistry data are difficult to collect accurately without thorough planning and quality equipment; these data are optional. Weather data are important for determining the quality of the observations (e.g., was an absence of amphibians due to observations made during a blizzard?)*

WEATHER, WIND: Indicate atmospheric conditions.

AIR TEMPERATURE: Take at chest height in shade. The Celsius scale is preferred.

WATER TEMPERATURE: Take 1 meter from margin and at 2 cm depth, or where egg masses are observed.

COLOR: This is a qualitative assessment of whether the water clear or tea-colored from organic (humic) acids.

TURBIDITY: This is a qualitative assessment of whether the water clear or clouded from suspended particulate matter.

SECTION 4 – HABITAT DESCRIPTION *These data are important for developing hypotheses to explain changes in abundance of amphibians. This section needs to be filled out only once for each site (a reasonable amphibian survey should include at least 2 – 3 visits to each site in one season).*

ORIGIN: Decide whether the lake is a natural geologic formation or man-made. Bodies of water enlarged by a dam are problematic. List them as man-made, but add an explanation in the space for additional notes on the back of the form.

DRAINAGE: Circle whether the site has permanent drainage, no drainage, or occasional drainage. Determining the potential for occasional drainage requires judgement. Look for clues in the topography and vegetation.

DESCRIPTION: Decide how best to describe the site. If there is evidence of past or present beaver activity, circle one of these choices in addition to your choice.

LENGTH, WIDTH: Record the maximum length and width of lakes and ponds. For streams, record the length and average width of the reach searched.

MAXIMUM DEPTH: Most times, you will not have access to a boat, so estimate depth (deep lakes are usually not important to amphibians).

STREAM ORDER: This is an index of stream size, and you will need a topographic map to determine it. First-order streams have no tributaries, second-order streams are formed by the confluence of two 1st-order streams, third-order streams are formed by the confluence of two 2nd-order streams, and so on.

PRIMARY SUBSTRATE: Circle the type that covers the majority of the bottom of the site.

EMERGENT VEGETATION: Circle the percentage of the margin of the site with emergent vegetation present, and list the dominant species. If you are botanically-disadvantaged, list the categories of the dominant species (e.g., cattail, sedges, etc.).

NORTH SHORELINE CHARACTERS: Describe the north shore of a lake or pond in terms of shallow water and emergent vegetation. This is important in evaluating quality of breeding habitat in some mountain locations.

FOREST CHARACTERS: List the closest distance between the water and the surrounding forest, and list the most common tree species. Leave these fields blank if there is no forest. Describe other surrounding habitat types in the notes section on the back of the form.

AMPHIBIAN SURVEY DATA SHEET – US FISH & WILDLIFE SERVICE, 4512 McMURRY AVE, FT. COLLINS, CO 80526-3400

(circle choice for shaded variables; supply value for others) (ver. 2/7/92)

DATE	BEGIN TIME	END TIME	OBSERVERS

LOCALITY

STATE	COUNTY	MAP NAME	OWNER	ELEVATION (circle scale) M FT

T	R	S	SECTION DESCRIPTION	UTM ZONE	NORTHING (or LAT)	EASTING (or LON)

AMPHIBIAN AND/OR GARTER SNAKE SPECIES PRESENT (INDICATE NUMBERS IN CATEGORIES IF POSSIBLE) — CIRCLE METHOD AND INDICATE IF VOUCHER SPECIMEN WAS COLLECTED

SPECIES	ADULTS/JUVENILES	CALLING?	TADPOLES/LARVAE	EGG MASSES	METHOD:
		Y N			VISUAL/AURAL ID DIP NET/SEINE HAND COLLECTED TRAPPED VOUCHER COLLECTED? YES NO
		Y N			VISUAL/AURAL ID DIP NET/SEINE HAND COLLECTED TRAPPED VOUCHER COLLECTED? YES NO
		Y N			VISUAL/AURAL ID DIP NET/SEINE HAND COLLECTED TRAPPED VOUCHER COLLECTED? YES NO
		Y N			VISUAL/AURAL ID DIP NET/SEINE HAND COLLECTED TRAPPED VOUCHER COLLECTED? YES NO
		Y N			VISUAL/AURAL ID DIP NET/SEINE HAND COLLECTED TRAPPED VOUCHER COLLECTED? YES NO

FISH PRESENT? YES ??? NO	FISH SPECIES:		
ENTIRE SITE SEARCHED? YES NO	IF NO, INDICATE AREA	METERS OF SHORELINE M² OF HABITAT	

PHYSICAL AND CHEMICAL ENVIRONMENT (CHEMISTRY VARIABLES OPTIONAL - USE EXTRA SPACES FOR ADDITIONAL MEASUREMENTS)

WEATHER: CLEAR OVERCAST RAIN SNOW	WIND: CALM LIGHT STRONG

AIR TEMP (circle scale) °C °F	WATER TEMP (circle scale) °C °F	COLOR: CLEAR STAINED	TURBIDITY: CLEAR CLOUDY
pH	ANC		

SITE DESCRIPTIONS - (SKETCH SITE AND PUT ADDITIONAL COMMENTS ON BACK OF SHEET)
OMIT THIS SECTION IF DATA HAVE BEEN COLLECTED ON A PREVIOUS VISIT

ORIGIN: NATURAL MAN-MADE	DRAINAGE: PERMANENT OCCASIONAL NONE

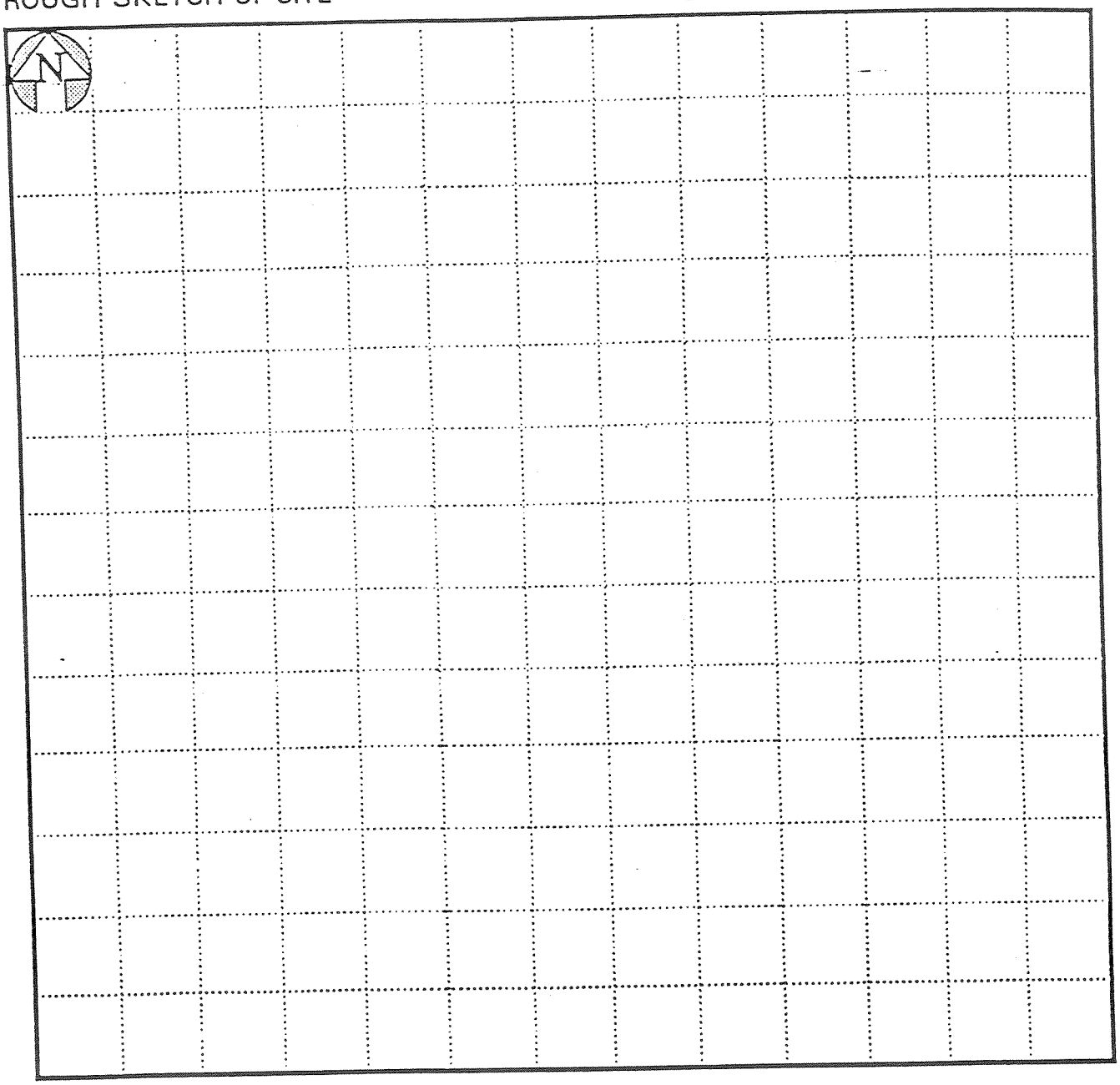
DESCRIPTION: PERMANENT LAKE/POND | TEMPORARY LAKE/POND | MARSH/BOG | STREAM | SPRING/SEEP | ACTIVE BEAVER POND | INACTIVE BEAVER POND

SITE LENGTH (M)	SITE WIDTH (M)	MAXIMUM DEPTH: < 1 M 1 – 2 M > 2 M

STREAM ORDER	1	2	3	4	5 +
PRIMARY SUBSTRATE:	SILT/MUD	SAND/GRAVEL	COBBLE	BOULDER/BEDROCK	OTHER
% OF POND LAKE MARGIN WITH EMERGENT VEGETATION:		0	1 – 25	25 – 50	> 50
EMERGENT VEGETATION SPECIES (LIST IN ORDER OF ABUNDANCE)					
NORTH SHORELINE CHARACTERS:		SHALLOWS PRESENT	SHALLOWS ABSENT	EMERGENT VEG PRESENT	EMERGENT VEG ABSENT
DISTANCE (M) TO FOREST EDGE		FOREST TREE SPECIES:			

Gap/USFS Habitat	USFWS Habitat

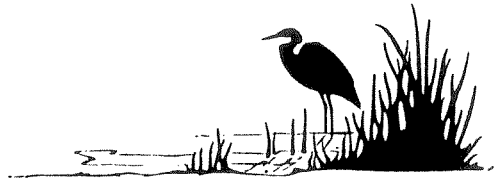
ROUGH SKETCH OF SITE GRID SPACING IS ____ METERS BETWEEN LINES



ADDITIONAL NOTES:

Miscellaneous Observation Form
Montana Natural Heritage Program
1515 E 6th Ave
PO Box 201800
Helena, MT 59620-1800

Observer_____
Address _____
_____
Phone No. _____



INSTRUCTIONS" Please use this sheet to submit sight, call, or specimen records of any Montana amphibian or reptile species. Use a separate line for each species and site. On the back of the sheet include any additional comments or supporting information. Please provide as specific location information as possible, particularly for the following species of special concern: Coeur d'Alene Salamander, Idaho Giant Salamander, Tailed Frog, Canadian Toad, Wood Frog, Snapping Turtle, Spiny Softshell, Short-horned Lizard, Sagebrush Lizard, Western Hognose Snake, and Smooth Green Snake. Documentation is required for Idaho Giant Salamander and Wood Frog (photo, through description, verification by experienced observer, etc.). An identification guide is available in the May/June 1995 issue of Montana Outdoors (reprints available at the MT Nat. Heritage Prog).

Species	Location	County	Township Range Section or UTM	Date Mo/Day/Yr	Time	# Adults	# Larvae
Example: Leopard Frog	McNab Pond	Carter	T01N R59E Sect 19 NE	5/20/94	8:30a	5	200
Example: Milk Snake	3.4 mi W, 1.2 mi N of Harlowton	Wheatland	5145200 N, 584700 E	8/15/94	11:15p	1	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							

Comments: Include method of observation, measurements, documentation for species of special concern, disposition of specimens, weather, etc. Numbers correspond to those on the other side of this sheet. Use additional space or sheets if necessary.

Example: Sunny warm day, about 75°. Adults (3 seen; 2 heard calling only) at margin of ponds in cattails. Very small tadpoles seen; 1 egg mass still present.
Example: Found dead in the road in sagebrush flat near rimrocks; 24" long; Colored with bands of yellow / black / red / black / yellow...; deposited in MSU Museum
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.

APPENDIX 2.

SURVEY TECHNIQUES FOR AMPHIBIANS AND REPTILES IN MONTANA

Salamander Detection/Collection Techniques

Long-toed Salamander (*Ambystoma macrodactylum*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still or slow moving water	early spring	pit trap, visual, cover		easy	
Adult - active	upland	spring - fall	cover, pit trap	rain	difficult	
Eggs	still water, most attached	early spring	visual, dip net		moderate	some eggs may be loose
Larvae	still or slow moving water		dip net, seine		easy	larvae may overwinter
Metamorphs		late summer, fall				
Juveniles						

Tiger Salamander (*Ambystoma tigrinum*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still or slow moving water	early spring	minnow & pit trap, visual		moderate	
Adult - active	upland, roads	spring - fall	driving, pit trap	rain	difficult	easy during mass migrations
Eggs	still or slow moving water	spring	visual		moderate	
Larvae	still or slow moving water	spring - summer	minnow trap, dip net, seine		easy	larvae may overwinter; neoteny occurs
Metamorphs	shoreline	late summer	pit trap, visual			
Juveniles						

Idaho Giant Salamander (*Dicamptodon aterrimus*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	streams, high lakes	spring & fall	minnow trap, rake and seine			
Adult - active	moist forest	spring - fall	pit trap	rain	difficult	
Eggs	under rocks				difficult	
Larvae	streams, high lakes	summer, fall	shock, snorkel, spotlight		easy	
Metamorphs						
Juveniles						

Coeur d'Alene Salamander (*Plethodon idahoensis*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding		late summer, fall				some breeding in spring , at surface
Adult - active	spray zones, seeps, talus	spring - fall	visual, cover, rake	rain, >7^{0}C	moderate	see conservation plan
Eggs	underground rock crevices?					eggs never found in the wild
Juveniles	spray zones, seeps, talus	spring - fall	visual, cover, rake	rain, >7^{0}C	moderate	no larval or metamorph stages

shading indicates best preformed at night

Anuran Detection/Collection Techniques

Tailed Frog (*Ascaphus truei*)

STAGE	LOCATION	OPTIMAL SEASON	TECHNIQUES	CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	cool, fast streams	fall	shock, visual		moderate	shock day only; visual easier at night with spotlight
Adult - active	in or near cool, fast streams	all year	shock, visual	rain	moderate	shock day only; visual easier at night with spotlight
Eggs	cool, fast streams	fall	visual			
Larvae	cool, fast streams	all year	shock, turn rocks w/ net below		moderate	several years to metamorphosis
Metamorphs						
Juveniles						

Western Toad (*Bufo boreas*)

STAGE	LOCATION	OPTIMAL SEASON	TECHNIQUES	CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still or slow moving water	spring - summer	visual		variable	2-3 month breeding season
Adult - active	wetlands and uplands	spring - fall	visual, night driving			active morning and evening
Eggs	bottom or around structure	spring -summer	visual		moderate	eggs may become covered by silt; difficult to ID
Larvae	still or slow moving water	spring - fall	visual, dip net		easy	tadpoles aggregate; difficult to ID without a microscope
Metamorphs	shoreline	summer, fall	visual		easy	may be very numerous; difficult to ID
Juveniles						

Great Plains Toad (*Bufo cognatus*)

STAGE	LOCATION	OPTIMAL SEASON	TECHNIQUES	CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still or slow moving water	spring - summer	visual, listening			
Adult - active	wetlands and uplands	spring - fall	visual, night driving	rain		
Eggs						difficult to ID
Larvae	still or slow moving water					difficult to ID without a microscope
Metamorphs						difficult to ID
Juveniles						

Woodhouse's Toad (*Bufo woodhousii*)

STAGE	LOCATION	OPTIMAL SEASON	TECHNIQUES	CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still or slow moving water	spring - summer	listening, visual		easy	during peak of breeding may call occasionally during the day
Adult - active	wetlands and uplands	spring - fall	visual, night driving	rain	moderate	
Eggs	bottom or around structure	spring - summer	visual		moderate	difficult to ID
Larvae	still or slow moving water	spring - summer	visual, dip net			difficult to ID without a microscope
Metamorphs	shoreline	summer	visual			may be very numerous; difficult to ID
Juveniles						

Anuran Detection/Collection Techniques

Western Chorus Frog (*Pseudacris triseriata*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	shallow, still water	spring	listening, spotlight, visual		easy	temporary & permanent water; also may call during the day
Adult - active	wetlands and uplands	spring - fall	visual, listening		difficult	usually incidental; may call in summer in rainy periods
Eggs	attached	spring	visual		moderate	
Larvae	still water	spring - summer	visual, dip net		easy	
Metamorphs	shoreline	summer	visual		variable	may be very numerous
Juveniles						

Pacific Chorus Frog (*Pseudacris regilla*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	shallow, still water	spring	listening, spotlight, visual		easy	temporary & permanent water
Adult - active	wetlands and uplands	spring - fall	visual, listening		difficult	usually incidental; may call in fall during rainy periods
Eggs	attached	spring	visual		moderate	
Larvae	still water	spring - summer	visual, dip net		moderate	
Metamorphs	shoreline	summer	visual			
Juveniles						

Plains Spadefoot (*Scaphiopus bombifrons*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still water	spring - summer	listening, visual, driving	rain		opportunistic breeders
Adult - active	terrestrial	spring - summer	night driving	rain		limited activity, usually underground
Eggs		spring - summer	visual			eggs hatch quickly
Larvae	still water	spring - summer	visual, dip net			metamorphose in weeks
Metamorphs						
Juveniles						

Anuran Detection/Collection Techniques

Bullfrog (*Rana catesbeiana*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	in or near permanent water	early-mid sum.	listening, visual, dip net		easy	territorial; difficult to catch
Adult - active	in or near permanent water	spring - fall	listening, visual, dip net		easy	territorial; difficult to catch but easier at night
Eggs	film at or below surface	early-mid sum.	visual		easy	
Larvae	permanent water	all year	visual, dip net		moderate	usually overwinter once
Metamorphs	shoreline of permanent water	late summer	visual			
Juveniles					easy	

Northern Leopard Frog (*Rana pipiens*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still water with vegetation	spring	visual, listening, dip net		variable	
Adult - active	marsh, wet meadow, shoreline	spring - fall	visual, dip net	warm, sunny	variable	usually easy under good conditions
Eggs		spring	visual		easy	eggs float or on bottom
Larvae	still water	spring - summer	visual, dip net, minnow trap		easy	
Metamorphs	shoreline	summer	visual, dip net		variable	
Juveniles					variable	

Spotted Frog (*Rana pretiosa*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still or slow moving water	spring	visual, dip net		difficult	call very soft; call 1-3 days
Adult - active	riparian and wetlands	spring - fall	visual, dip net	warm, sunny	easy	
Eggs	float at surface	spring	visual		easy	egg masses tend to be clumped
Larvae	still or slow moving water	spring - summer	visual, dip net, minnow trap		easy	may hide in vegetation and bottom detritus
Metamorphs	shoreline, meadows	late summer, fall	visual		easy	
Juveniles	riparian and wetlands	spring - fall	visual, dip net	warm, sunny	easy	

Wood Frog (*Rana sylvatica*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - breeding	still or slow moving water	spring	visual, listening			explosive breeders
Adult - active	terrestrial, shoreline	spring - fall	visual		difficult?	
Eggs	attached to vegetation	spring	visual			
Larvae	still or slow moving water	spring - summer	visual, dip net, minnow trap			
Metamorphs						
Juveniles						

Turtle and Lizard Detection/Collection Techniques

Snapping Turtle (*Chelydra serpentina*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	still or slow moving water	spring - fall	visual, turtle trap	sunny	moderate	
Eggs						
Juveniles						

Painted Turtle (*Chrysemys picta*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	still or slow moving water	spring - fall	visual, turtle trap	sunny	easy	easiest to see in early spring and mid-morning
Eggs	buried in sand or gravel					
Juveniles						

Spiny Softshell (*Trionyx spiniferus*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	still or slow moving water	spring - fall	visual, turtle trap	sunny	difficult	in large slow rivers and backwaters
Eggs	buried in sand or mud					
Juveniles						

Northern Alligator Lizard (*Elgaria coerulea*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	forest edge, rocks, talus	spring - fall	visual, raking	sunny	difficult	
Juveniles						young are born alive

Short-horned Lizard (*Phrynosoma douglasi*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	sandy or loose soil	spring - summer	pit traps, visual		difficult	look near ant mounds
Juveniles		late summer	pit traps		difficult	young are born alive

Sagebrush Lizard (*Sceloporus graciosus*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	variable - on ground	spring - fall	visual/noose, funnel or pit trap	sunny	moderate	arid areas
Eggs						
Juveniles		late summer	visual, funnel or pit trap			

Western Skink (*Eumeces skiltonianus*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	variable, rocky	spring - fall	visual-cover, pit trap	sunny	difficult	easiest late spring - early summer
Eggs						
Juveniles						

Snake Detection/Collection Techniques

Rubber Boa (*Charina bottae*)

STAGE	LOCATION	SEASON	TECHNIQUES	CONDITIONS (OPTIMAL)	DIFFICULTY	REMARKS
Adult - active	near riparian areas, rocky areas	spring - fall	night driving, visual, funnel trap	after rain;>10^{0}C	difficult	nocturnal/crepuscular but will bask
Juveniles	near rocks	late summer- fall	visual, funnel trap		difficult	young born alive

Racer (*Coluber constrictor*)

STAGE	LOCATION	SEASON	TECHNIQUES	CONDITIONS (OPTIMAL)	DIFFICULTY	REMARKS
Adult - active	variable	spring - fall	visual, funnel trap	sunny, warm	easy-moderate	easiest to see in spring
Eggs						
Juveniles	variable	late summer- fall	visual, funnel trap		moderate	

Western Hognose Snake (*Heterodon nasicus*)

STAGE	LOCATION	SEASON	TECHNIQUES	CONDITIONS (OPTIMAL)	DIFFICULTY	REMARKS
Adult - active	arid areas	spring - fall	visual, funnel trap		difficult	
Eggs						
Juveniles						

Milk Snake (*Lampropeltis triangulum*)

STAGE	LOCATION	SEASON	TECHNIQUES	CONDITIONS (OPTIMAL)	DIFFICULTY	REMARKS
Adult - active	rim rock	spring - fall	cover, visual, funnel trap		difficult	may be easiest in May-early June by turning over rocks
Eggs						
Juveniles						

Smooth Green Snake (*Opheodrys vernalis*)

STAGE	LOCATION	SEASON	TECHNIQUES	CONDITIONS (OPTIMAL)	DIFFICULTY	REMARKS
Adult - active	meadows?	spring - fall	visual, funnel trap			
Eggs						
Juveniles						

Gopher Snake (*Pituophis catenifer*)

STAGE	LOCATION	SEASON	TECHNIQUES	CONDITIONS (OPTIMAL)	DIFFICULTY	REMARKS
Adult - active	variable - on ground	spring - fall	funnel trap, visual, night driving	sunny mornings	moderate	easiest to find at den sites in spring and fall
Eggs						
Juveniles		late summer	visual, funnel or pit trap			

Snake Detection/Collection Techniques

Western Terrestrial Garter Snake (*Thamnophis elegans*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	variable	spring - fall	visual, funnel trap	sunny mornings	easy	easiest to find at dens (spring) or riparian foraging areas
Juveniles	usually near water	late summer	visual, funnel trap		easy	young born alive

Plains Garter Snake (*Thamnophis radix*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	variable	spring - fall	visual, funnel trap	sunny mornings	easy	easiest to find at dens (spring) or riparian foraging areas
Juveniles	usually near water	late summer	visual, funnel trap		easy	young born alive

Common Garter Snake (*Thamnophis sirtalis*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	usually near water	spring - fall	visual, funnel trap	sunny mornings	easy	easiest to find at dens (spring) or riparian foraging areas
Juveniles	usually near water	late summer	visual, funnel trap		easy	young born alive

Western Rattlesnake (*Crotalus viridis*)

STAGE	LOCATION	SEASON	TECHNIQUES	OPTIMAL CONDITIONS	DIFFICULTY	REMARKS
Adult - active	variable	spring - fall	visual/listening, funnel trap		moderate	easiest to find at dens in spring and fall
Juveniles	near rocky gestation sites	late summer	visual/listening, funnel trap		moderate	young born alive

APPENDIX 3.

SITES SURVEYED DURING 1996

AMPHIBIAN AND REPTILE SURVEYS

Appendix 3. Sites surveyed during 1996 amphibian and reptile surveys.

COUNTY	DATE	LOCATION	TOWNRANGE		ELEVATION	START-TIME	END-TIME	# GROUPS	SUCCESSFUL
Teton	5 26 1996	Blackleaf WMA	T26NR08W	20 NWSE		1115	1120	3	N
	5 26 1996	Blackleaf WMA pond	T26NR08W	18 NESE		1750	1820	1	Y
	5 29 1996	Blackleaf Swamp	T26NR08W	28 N2		1210	1530	3	Y
	5 29 1996	Ponds on E. edge of Blackleaf WMA	T26NR08W	14 SWSE		1600	1625	2	Y
	5 30 1996	Beaver pond complex on Cow Creek, Rocky Mountain Front	T26NR09W	1 SE		1100	1210	2	N
	5 30 1996	Rocky Mountain Front pond above Cow Creek	T26NR09W	1 NE		1020	1030	2	N
	5 30 1996	Ephemeral pond	T27NR09W	35 NWSE		1425	1600	2	Y
	5 31 1996	N. Fork Dupuyer Pond, upland	T27NR09W	23 N2NW		1420	1435	2	Y
	5 31 1996	Backwater/spring on N. F. Dupuyer River	T27NR09W	22 SESE		1310	1320	2	N
	6 11 1996	TETON R., W FK, BEAVER PONDS ~2MI N OF CAVE MTN CAMPGRND	T25NR09W	23	5150	1830	1945	1	N
	8 15 1996	UPPER BLINDHORSE CK	T25NR09W	1	6300	1230	1300	1	N
	8 15 1996	LAKE ON BLACKLEAF WMA	T26NR08W	27 SW	4801	1225	1335	1	N
	8 15 1996	BLACKLEAF WMA, SMALL PONDS SSE OF ANTELOPE BUTTE	T26NR08W	33 NE	4820	1335	1500	1	N
	8 15 1996	UPPER PAMBURN CK	T25NR08W	19	6000	1530	1700	1	N
	8 16 1996	UNNAMED TRIB S OF CLARK FORK MUDDY CK	T25NR08W	18	6250	940	1100	1	N

COUNTY	DATE	LOCATION	TOWNRANGE	ELEVATION	START-TIME	END-TIME	# GROUPS	SUCCESSFUL
8	16 1996	CLARY COULEE	T25NR09W 25	5100	740	940	1	N
8	16 1996	CLARK FK MUDDY CK & 3 DRY PONDS	T25NR08W 6		1100	1230	1	N
9	11 1996	E FORK BLACKLEAF CK	T26NR09W 13 W 2	5600	1520	1620	1	N
9	11 1996	BEAVER PDS N OF BLACKLEAF CK	T26NR09W 13 SENE	5300	1630	1720	1	N
6	21 1993	Pine Butte Swamp Preserve	T24NR08W 13 NWNW	4790	1320	1335	1	Y
6	21 1993	Pine Butte Swamp Preserve	T24NR08W 12 SWSE	4610	1140	1220	1	N
6	21 1993	Pine Butte Swamp Preserve	T24NR07W 6 E2SW	4610	1355	1435	1	N
6	21 1993	Pine Butte Swamp Preserve	T24NR07W 7 NENE	4580	1445	1540	1	Y
6	22 1993	southeast of Pine Butte	T24NR07W 17 SE	4500	1120	1155	2	Y
6	22 1993	Bellview Road pond, near Pine Butte	T24NR07W 20 NESW	4500	1030	1045	2	Y
6	22 1993	southeast of Pine Butte	T24NR07W 17 NE	4500	1240	1420	2	Y
6	22 1993	Pine Butte Swamp Preserve	T24NR08W 2 SESE	4710	915	935	2	Y
5	26 1994	7 Lazy P. Ranch	T25NR09W 26					
5	26 1994	Pond 0.4 road mi. past Cave Mountain turnoff on FS RD 144	T25NR09W 26					
5	26 1994	0.7 mi. W. of Jones Creek on FS RD 144.	T25NR09W 15					

APPENDIX 4.

AMPHIBIANS AND REPTILES

OBSERVED DURING SURVEYS

IN 1996

Appendix 4. Amphibians and reptiles observed during surveys in 1996.

Site	Person Hrs:min	Total number of adults/juv of each species AMTI	PSTR	RAPR	THSI	THEL
Blackleaf Swamp	20:00		6			
pond E edge Blackleaf WMA	1:15		4			
pond Muddy Creek drainage	2:00	5	1			
N. Fork Dupuyer pond	0:45		1	10*		
S. Fork Dupuyer pond	4:45	1	3	1	1	

[1]AMTI=Ambystoma tigrinum; PSTR= Pseudacris triseriata; RAPR=Rana pretiosa; THSI=Thamnophis sirtalis; THEL=Thamnophis elegans.

* denotes site with breeding, i.e. tadpoles, larvae, or eggs present

APPENDIX 5.

AMPHIBIANS AND REPTILES

REPORTED FROM IN AND AROUND THE

STUDY AREA

Appendix 5. Amphibians and reptiles reported from in and around the study area.

SNAME	DATE	SURVEY	DATA TYPE	BREEDING	INSTITUTE	ACCSN_NO	COLLECTOR
COUNTY	TOWNRANGE						
LOCATION			COMMENTS				
AMBYSTOMA TIGRINUM							
	5 3 1996	MT961354	Photograph	P			Reichel, J. D.
Teton		T27NR09W	35	NWSE			
Ephemeral pond		1 adult, photo					
	5 2 1996	MT961346	Museum specimen	B	MTHP	2155	Reichel, J. D.
Teton		T26NR08W	18	NESE			
Blackleaf WMA pond				5 larvae			
	6 2 1993	MT930208	Observation	B			Jacobs, C
Teton		T24NR07W	17	SE			
S.E. Pine Butte				larva 3" long			
BUFO BOREAS							
	5 2 1994		Observation	B			Reichel, J. D.
Teton		T25NR09W	26	SESE			
7 Lazy P Ranch, Lewis and Clark NF, 5100 ft.				3 egg masses seen by J. Reichel.			
	8 1996		Observation	P			Hanna, D.
Teton		T24NR08W	9	NW			
Teton County							
PSEUDACRIS TRISERIATA							
	6 2 1993	MT930211	Call heard only	P			Reichel, J. D.
Teton		T24NR07W	17	NE			
Pine Butte Swamp Preserve.				Field visual/aural ID by J. Reichel and C. Jacobs.			
	6 2 1993	MT930210	Observation	B			Reichel, J. D.
Teton		T24NR07W	20	NESW			
Bellview Rd Pond				Field visual/aural ID by J. Reichel and C. Jacobs			
	6 2 1993		Observation	P			
Teton		T25NR08W	34	NENE			
near the Teton River, Pine Butte Swamp Preserve.				Field ID of calls			
	6 2 1993	MT930208	Observation	B			Reichel, J.D.
Teton		T24NR07W	17	SE			
SE Pine Butte				30 tadpoles (some with legs) observed.			
	6 2 1993	MT930209	Call heard only	P			Reichel, J. D.
Teton		T24NR08W	2	SESE			
Pine Butte Swamp Preserve.				Field visual/aural ID by J. Reichel and C. Jacobs.			

SNAME	DATE	SURVEY	DATA TYPE	BREEDING	INSTITUTE	ACCSN_NO	COLLECTOR
	COUNTY	TOWNRANGE					
	LOCATION			COMMENTS			
	5 2 1996	MT961351	Observation	P			Reichel, J. D.
	Teton	T26NR08W	14	SWSE			
	Ponds on E. edge of Blackleaf WMA			4+ adults			
	5 3 1996	MT961358	Observation	P			Reichel, J. D.
	Teton	T27NR09W	23	NNW			
	N. Fork Dupuyer Pond, upland			1 adult calling.			
	6 2 1993	MT930205	Observation	B			Reichel, J. D.
	Teton	T24NR08W	13	NWNW			
	Pine Butte Swamp Preserve.			Field sighting, J. D. Reichel and D. Hanna			
	5 3 1996	MT961354	Photograph	P			Reichel, J. D.
	Teton	T27NR09W	35	NWSE			
	Ephemeral pond			3 adults, photo			
	5 2 1996	MT961350	Observation	P			Reichel, J. D.
	Teton	T26NR08W	28	N			
	Blackleaf Swamp			6 adults, calling.			
	6 2 1993		Call heard only	P			Reichel, J. D.
	Teton	T24NR08W	12	SESW			
	small ephemeral pond just N of the Kiosk on Pine Butte Swamp Preserve			60 F at 2230; overcast; calm; with Connie Jacobs			
	5 2 1996	MT961346	Observation	P			Reichel, J. D.
	Teton	T26NR08W	18	NESE			
	Blackleaf WMA pond			1 adult, calling.			
RANA PIPIENS							
	7 2 1993	MT930207	Observation	P			Reichel, J. D.
	Teton	T24NR07W	7	NENE			
	Pine Butte Swamp Preserve.			Field sighting			
RANA PRETIOSA							
	5 3 1996	MT961358	Observation	B			Reichel, J. D.
	Teton	T27NR09W	23	NNW			
	N. Fork Dupuyer Pond, upland			10 adults, 20-30 larvae.			
	5 3 1996	MT961354	Observation	P			Reichel, J. D.
	Teton	T27NR09W	35	NWSE			
	Ephemeral pond			1 adult			

SNAME	DATE	SURVEY	DATA TYPE		BREEDING	INSTITUTE	ACCSN_NO	COLLECTOR
	COUNTY	TOWNRANGE						
	LOCATION				COMMENTS			
THAMNOPHIS ELEGANS								
	5 3 1996		Observation		P			Reichel, J. D.
	Teton		T27NR09W	36	SENE			
	N Fork Dupuyer Creek				Sunny S facing slope on old road in rocky area of open stunted pine & fir.			
	9 1 1996		Observation		P			Reichel, J. D.
	Teton		T26NR08W	18	NWNW			
	0.2 mi E of USFS boundary on Blackleaf Rd.				Sunning on road.			
	6 1 1996		Observation		P			Werner, J. K.
	Teton							
	3 mi N of Blackleaf Canyon Rd.				Alive on road.			
THAMNOPHIS SIRTALIS								
	5 3 1996	MT961354	Observation		P			Reichel, J. D.
	Teton		T27NR09W	35	NWSE			
	Ephemeral pond				1 adult.			